
Photon
Issue 7
http://www.photonezine.com
Deepsky Review
Brainless Astronomy
2005 Tucson Meteorite Show
The Ancient Astronomers of Newgrange
Long Night of the Comets
MallinCam CCD Camera Review
Sudbury Crater

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Vol.2 No.1 **Issue 7** http://www.photonezine.com

Editorial

Welcome to the seventh issue of **Photon**. As usual, my thanks go to all the contributors who took the time to send in material and photos for this issue. As you'll know, if you're reading this, there's now a charge for Photon. I had hoped I'd be able to line up enough advertisers to cover the ezine's ongoing production costs, but that didn't happen.

The good news is that I'll now be able to pay contributors. It won't be much to start with ($3.00 per page flat rate) but as sales increase, so will the payments. So, write a couple of pages for the ezine and it'll cover the cost of the magazine for a year! Hopefully, that's a bit of an incentive.

In this issue, you'll find that thumbnails let you navigate better though the issue (only available in the complete issue PDF), using the tool in Adobe Acrobat Reader.

Following on from Philip Harrington's review of the Canon EOS 300D/Digital Rebel in the last issue, processing RAW files has become easier with the introduction a a package called RawShooter Essentials (see Page 39). I mentioned in the last editorial that I'd be setting up a webpage on the Digital Rebel. Time hasn't allowed for that (yet) but I'll get to it over the next couple of weeks. It'll be listed on my NightSkyObserver site when it does go live. Judging by the recent release of Canon's EOS 350D/Digital Rebel XT and EOS 20D models, I'll have to expand the range of the webpage!

This issue sees Rod Mollise reviewing the Deepsky Astronomy Software package which he uses for planning observing sessions. Jack Huerkamp has two articles in this issue: one looks at turning a 17.5" Dobsonian style telescope into a GOTO 'scope; his other article (part 2 next issue) reviews the B&W and Color CCD cameras from MallinCam and how they can improve the sensitivity of your 'scope. Mark Bostick talks about his recent trip to the 2005 Tucson Meteorite Show; Anthony Murphy concludes his series on Newgrange and its associated megalithic mounds; Charles O'Dale closes his account of his investigations of the Sudbury Crater in Ontario, Canada; Mark Deprest recounts the night he and some friends hunted down six comets and Tim Carr takes a look at Wilhelm Herschel, ex-bandsman, draft-dodger and discoverer of the planet Uranus.

By the way, since there was a penumbral eclipse of the Moon in April, did you get any photos of the event? Was there any noticeable dimming of the Moon?

Jupiter and Saturn are now well placed in the night sky for viewing and imaging. There's also been a large sunspot crossing the Sun in recent days. If you managed to image it, why not send in your results.

Call for Submissions

Now that I'm paying contributors, maybe that'll prompt more of you to send stuff in. The closing date for Issue 8 is June 10th so you've over a month to put something together! If you've read the previous issues, you'll know the type of material I'm looking for. If not, the Submissions page provides some ideas, but things like book reviews, society profiles, equipment reviews and human-interest stories are what I'm looking for.

Don't forget that the ezine contains hot-links (underlined blue text) to external websites so, to get the most out of it, it's better if you're online when reading it. The links take you to websites that provide background information on the subject or to definitions of unfamiliar terms.

As ever, the ezine is peppered with little anecdotes and short story items. If you've come across any or something has happened personally to you, please let me know. If you'd like to remain anonymous - that can be arranged!

Night Sky Observer News

As you know, I run the Night Sky Observer website. The site has been undergoing some revision, particularly in relation to navigation and the Mars page has been completely revamped. If you're interested in selling any of my software through your website, I've partnered with RegNow to create an affiliate program that gives a 30% commission on sales. Details at:
http://www.nightskyobserver.com/NSOaffiliate.html

LunarPhase Pro News

If you are a LunarPhase Pro user, V2.20 was released on April 12th, 2005. If you're not already using this version and you are using a V2.xx release of the software, you can download V2.20 via the ***Check for Upgrade*** button on the About screen. This release adds several new features to the software. V1.xx users can upgrade to Version 2 at:
http://www.lunarphasepro.com/support

JupSat Pro News

V1.50 of JupSat Pro was released on March 30th. 2005. This version calculates times of satellite eclipses by Jupiter's shadow and satellite track diagrams now match the selected optics. Existing users can download the upgrade from the JupSat Pro page.

Gary Nugent
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http://www.nightskyobserver.com

For up-to-date news on astronomy and space:
The Night Sky Observer

DeepSky Astronomy Software

By Rod Mollise

CD ROM version: $52.99
DVD ROM version: $79.99
http://www.deepskysoftware.net/index.html

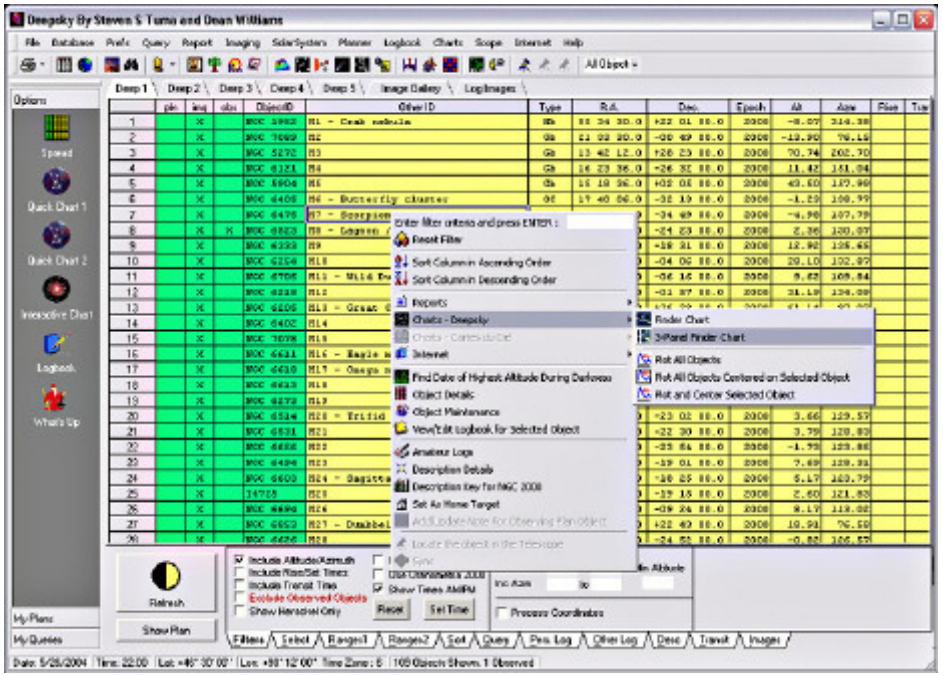
How do you plan your observing runs? Do you plan them at all? If you don't, you're missing a lot. All too many amateurs begin to lose interest in our wonderful pursuit because they are "not seeing anything." Is it the weather? The light pollution? A too-small telescope? When the situation is scrutinized in detail, the culprit usually turns out to be "none of the above." Usually, what you'll find is that the observer in question looks out the door, sees that the sky is clear, grabs scope, star atlas and a box of eyepieces and heads for the backyard or a club observing site. Once there, she/he looks up at the stars, thinks for a minute, points the scope to the obvious goodies - the M42s, M13s and other bright ones - stops, thinks for a minute, glances at the atlas, shrugs, and moves everything back inside. Ho-hum. Not much to see tonight.

In reality, of course, there was a tremendous amount to be seen beyond the bright showpieces, a tremendous amount for any telescope. But you have to have some idea of what you want to look at if you're gonna see it. Vague memories of good objects and a mag 6 star atlas ain't gonna get it. You need a PLAN…a list of objects to observe along with their vital statistics and detailed charts for finding if you don't use a goto scope. If you have a list, a plan, a program for the evening, you'll see incomparably more than you will if you just wing it.

How do you make such a plan? A copy of Burnham's Star Atlas, Sky Atlas 2000, and a pencil and paper are one way to do it. But in this age of powerful desktop computers, there's a better way. That better way is one of the planning-logging programs now available for amateur astronomers. These programs are essentially massive databases of deep sky objects, but the most modern of them also allow you to print detailed star charts (though, in this day of goto scopes, detailed charts are probably less necessary than they used to be). The two top programs in this genre of astronomy software for Windows PCs, SkyTools 2 and Deepsky, can produce charts easily competitive with big-name planetarium software, and certainly far more detailed than what you'll find in the venerable Sky Atlas 2000. Or even Uranometria or Milennium.

Skytools 2 and Deepsky, huh? Which to choose? As I've said before, I use both. I simply love Skytools, but there are things I love about Deepsky, too, so I use both, and have found appropriate tasks for each.

Deepsky, now officially "Deepsky Astronomy Software

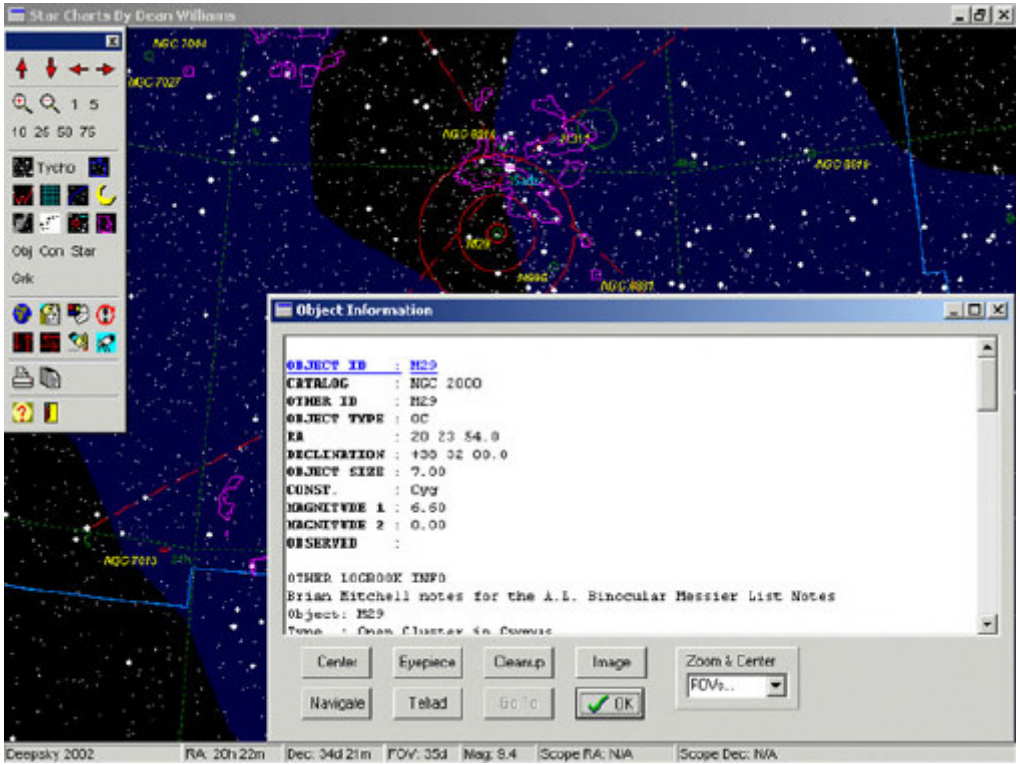


Deepsky has an extensive database environment

(DAS)," is the latest version of a program that's been around for quite a few years. Its author, Steve Tuma, has continued to upgrade if through almost yearly releases, and it's the year of its release was appended to the program name: "Deepsky 96," "Deepsky 2000," etc. The program is now stable and settled, though, and I think Steve's decision to henceforth refer to it just as "Deepsky" is a good one, and one that makes things less confusing for new users.

What exactly does Deepsky do? For details, I'll refer you to the reviews of earlier releases I've done in these pages in the past, but to summarize, this is a humongous Access database that includes over 700,000 deep sky objects and the entire Hubble Guide Star Catalog (for the CD and DVD issues). Users can run detailed searches easily, allowing them to pluck objects that fit their criteria (visibility, types, magnitudes, constellations, and more) and assemble these objects into an observing list that can be printed out to provide a clear and useful plan for use at the telescope. Detailed information is available on any of the objects in the plan (or, indeed, in Deepsky's databases), and charts can be produced as desired.

If you're like many of us, you won't be printing out anything. You'll be using a laptop with your goto telescope. In that case, Deepsky becomes even sweeter. It uses ASCOM to allow you to reliably point your goto scope (many models are supported) at any of the objects in your plan, on the charts, or in the database. For some scopes, you can even enable a "slideshow" mode, with the telescope pointing itself at successive objects in your list without your intervention. But what if you're old fashioned (like Uncle Rod), and still like paper charts? Deepsky gives you two options. You can use the charts generated by the program itself (the charting module was done by Dean Williams). In addition to standard atlas-style charts, you've got numerous options for doing finder type charts in various scales and styles. If you're more comfortable with something you're already familiar with, Deepsky interfaces with the famous freeware program Cartes du Ciel, so that you can use CdC to generate your charts instead of Deepsky. A copy of Cartes is included on the CD/DVD ROM versions of deep sky.



DeepSky star chart and information

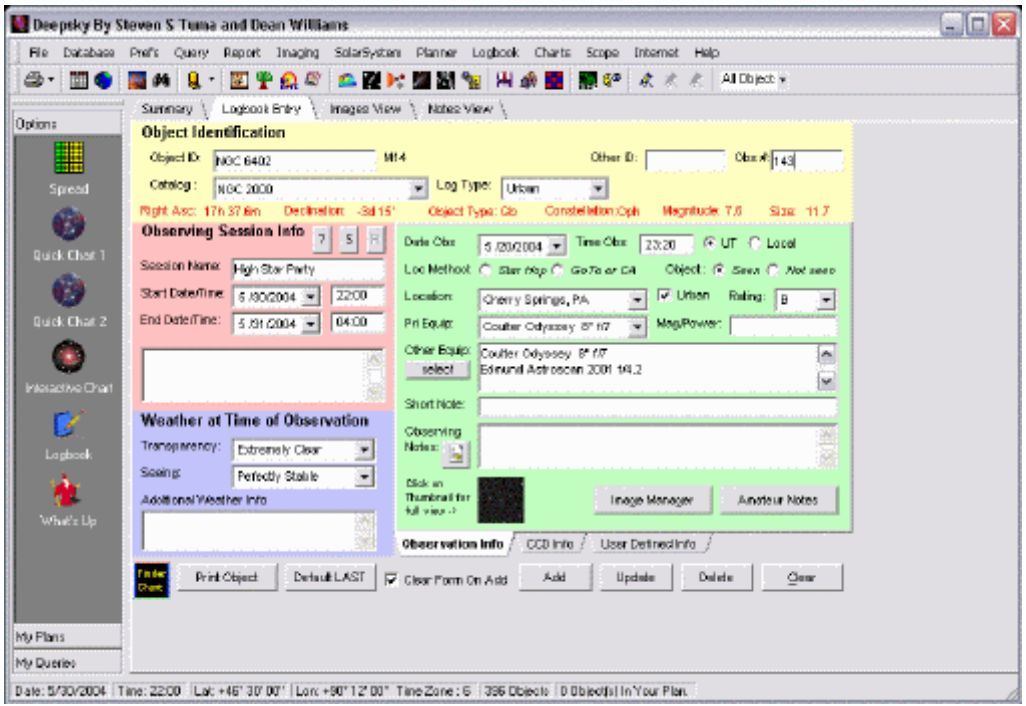
Which brings up the question of what's the difference between the three versions of this program, downloadable, CD and DVD? The downloadable version, which is a very good value, is different from the other two in that it has a limited set of stars that can be plotted on the charts. You can "only" go down to magnitude 11 rather than the 15.5 of the CD and DVD editions. It also lacks a couple of the bonus software programs included on the disks: Cartes du Ciel, and Virtual Moon Atlas. The big difference, though, is images. While the CD and DVD feature 11,000 and 400,000 object images -- most culled from the Digital Sky Survey -- respectively (yes, 400 ***thousand***), the downloadable version must make do with 109. All versions include the Pocket Deepsky Program, which allows you to download lists to your Pocket PC and do other cool things. Which would I choose? Heck, man, get the DVD! One of ***the*** most useful features of this program when you're in the field is its image database. I've often found

that being able to look at a picture of my quarry makes the difference between finding it and missing it. If you're out in the boondocks, you won't likely have an Internet connection, and the image DVD that comes with the DVD edition is much better than dew-soaked inkjet printer hard copies. The DVD edition's program is contained on a CD, and is identical to the CD version, by the way.

How about the program itself? How does the latest version improve on what's gone before? Deepsky has been around for a long time now, the first release, I recall, being Deepsky 96. Steve should have had the time to get the bugs out, and he definitely has. This version feels the most solid of any of the previous editions. I've never had it crash or do anything weird on me, and the installation program seems smoother and less prone to hang-ups than some of the earlier versions.

How about y'all out there in the choir? Those who are already convinced that Deepsky is a **great** program, but who are wondering whether they should upgrade from an earlier version? My answer is a big y-e-s! For one thing, Mssr. Tuma makes upgrading attractively inexpensive. For another thing, you don't want to miss the program's many enhancements. Here is a small sample:

- Consolidated logbook spreadsheet screen and logbook entry onto the main screen making the whole logbook easier to use.
- Specify which columns you want to appear on the logbook. There are now nearly 50 columns that you can specify.
- Added other ID as a searchable field using the logbook advanced search button.
- There is a Freeze Columns option on the logbook spreadsheet that freezes columns to the left of the cell.
- The logbook entry screen is completely redesigned. All information is now entered on one screen. In addition, information on the observed object like RA, Dec, Type, Constellation, magnitude, and size are shown on the logbook entry screen for reference.
- There is now a Weather Conditions section in the logbook that lets you store the weather, seeing, transparency, and other notes related to the weather.
- You now have the ability to restore backed up logbooks. You would use this if you had to reinstall Deepsky.
- The search screen on the main spreadsheet hasn't changed much over the years, but now it has been completely redesigned. It is now much easier to find what you are looking for. Besides adding a common name lookup feature, you can specify multiple criteria and save the criteria set for later use. I think you will like this new feature!
- Deepsky can now display Uranometria 2000 chart numbers's in the spreadsheet
- Find Date of Highest Altitude During Darkness. You can now right click an object in the spreadsheet and select this option to find the date the object will be highest in the sky for your location. Information displayed will include altitude, azimuth, date, time, altitude of the moon, and the moon phase.
- Observing Plan Manager lets you see a list of all your plans in a spreadsheet format. You can rename or delete them and also quickly open them.



Deepsky observation log

Excuse me, but I see it's clear outside. Am I prepared for that? You bet I am. With Deepsky, I most definitely am!

Brainless Astronomy 101

By Jack Huerkamp

Brainless astronomy – what's that, you may ask. Well, that's a term that was introduced to me by Beth Watzke, a member of the Pontchartrain Astronomy Society and a school teacher. She uses that phrase to describe astronomers that use GoTo systems to aim their scopes without the need to know anything about the sky. Her husband, John had a Meade LX90 and has graduated to a Meade LX200GPS – both GoTo telescopes. He practices "brainless astronomy". She on the other hand likes to learn the sky by star hopping with her Orion 10" Dob.

For over 20 years, I observed like Beth with my 17.5" Dob to find objects. My original Dob wasn't fancy; but it gave excellent views of deep sky objects. It wasn't computerized and it didn't possess setting circles. To locate deep sky objects, I had to pull out my star charts, climb the ladder to the eyepiece, and with a red light shinning on the map, follow a trail of stars to the target. On many occasions, I gave up in frustration – my hunt was not successful. This wasted valuable observing time in an area of the country where good nights are rare.

TSP'82 with Original Dob

In 1997, I retrofitted my 17.5" scope. Well, actually, I saved the primary mirror and burnt up the rest on my trash pile. I ordered an AstroSystems TeleKit to house the primary, and spent 39 months finishing it. Two surgeries and an addition to the home delayed TeleKit construction. When the scope was completed, I decided to embark on a new way to observe. I added 8192 step encoders on the altitude and azimuth axes, and an Argo Navis DSC (digital setting circle).

Argo Navis

18" NightSky Scope with ServoCAT

The Argo Navis provided the brain, letting me know how far the scope was from the desired target. By simply pushing the scope in altitude and azimuth to zero out the offset positions determined by the "black box" I was able to locate targets. However, this was not a true GoTo system – it was PushTo.

While at the 2003 Mid-South Stargaze, I ran into Jim Nadeau. He was delivering a new 18" NightSky Scope to Elliott McKinley. Elliott had ordered all the bells and whistles from Jim – including a ServoCAT. I was able to see Elliott's scope in action at the event, and decided to make the final jump to brainless astronomy with my 17.5" TeleKit.

What's a ServoCAT?

The ServoCAT system is a complete electronics package that allows for control of a telescope using either an Argo Navis or Sky Commander as the "reference". A CAT can be used to control either a Dobsonian or an equatorially mounted telescope. "Control" means the

ServoCAT-Sky Controller

ability to track or automatically follow the sky, slew (move around) at various speeds selectable by the user, and "Go To" an object..

The "Standalone" version of the system is called the ServoCAT-Sky. Those desiring to use a computer in lieu of an Argo Navis (AN) or Sky Commander need to purchase the ServoCAT-BB. The ServoCAT-Sky is the unit I purchased since I already owned an Argo Navis. The Sky version allows users to connect their AN or Sky Commander to the ServoCAT system without the need for a PC. It provides for tracking and ***full*** GoTo operation using the Digital Setting Circles (DSC) as the object database! All features of the DSC remain including object ID and Search as well as Constellation search!

The system includes a full-featured wired handpad; and an optional (2nd!) ***wireless*** handpad is available! Handpad SLEW (5 to 6 degrees per second), GoTo as well as other functions provide for great control and full use of the telescope! Although a PC is not needed at the telescope, the setup of parameters is through a simple Windows utility. It is performed once and the information is stored in the controller. More than one scope can be programmed into the software, so the controller can easily be transferred to another ServoCAT motorized scope if desired. High power viewing is practical because the CAT automatically tracks the target once it is located!

The ServoCAT-Sky version uses the DSC encoders mounted on the axes as an "absolute" reference. Therefore manual movement or slip (intentional or not) of the scope will not affect proper tracking rates and GoTo capability. A realignment is not required if the scope is manually moved as long as the groundboard does not change position.

Full kits are available for TeleKits, Obsessions, and Obsession clones. The kit includes:

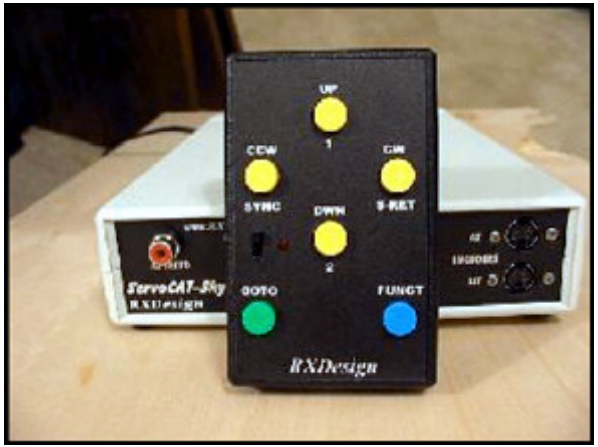
- The Controller Unit
- 8 Button Wired Handpad
- Two Deluxe Servo Gearboxes
- All Mounting Hardware
- All Cables and Wiring
- Full Instructions

Optional items include:

- Round Groundboard
- Powered Groundboard
- Wireless Handpad

The current price for a kit for a 15"-20" scope is $1599. The kit for a 21"-30" scope is $1699. The CATpaw Wireless Handpad is $219 and the Argo Navis is $399. There is also a ServoCAT Jr. for 8" through 14" scopes for $1369.

For more information on the ServoCAT, contact Gary Myers at: http://www.stellarcat.biz



ServoCAT Handpad

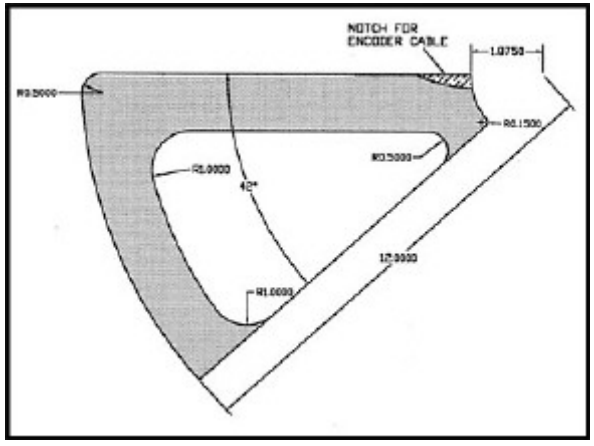
ServoCAT Installation

Within a week of Mid-South Stargaze 2003, I contacted Gary Myers of StellarCAT (formerly RXDesign) and ordered a system. Gary was anxious to get a CAT in-

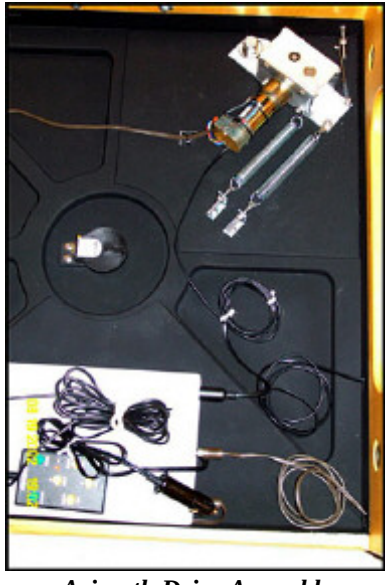
Rocker Base with Two Plugs

Plugs Covered With Plywood

Newer TeleKits have an advantage over older ones regarding adding the azimuth drive to the rocker. My scope had the original, double-thickness rocker base with pockets cut into it to reduce weight while retaining strength. As the azimuth drive requires a smooth, flat mounting surface, I needed to devise a means to fill in some of the "holes" in the rocker. I prepared a full-scale AutoCAD drawing of the inside of the rocker bottom showing all the pockets. From it, I made a template and cut out two plugs from pieces of Home Depot ¾" Birch plywood. The plugs were then covered with a section of 1/8" model aircraft plywood to provide a solid, smooth base for the azimuth drive.
The necessary holes for the azimuth drive wheel and manual release clamp were drilled into the rocker, and the azimuth drive bolted into place.



Altitude Wedge

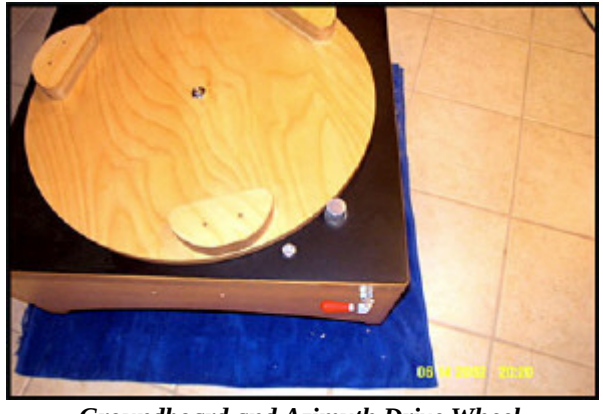


Azimuth Drive Assembly

stalled on a TeleKit; and since I was his guinea pig, he gave me a slight discount off of the then list price of $1499. The turn around time for the CAT was about 4-6 weeks, and while I waited for its arrival, I downloaded the information available on the RXDesign website. This quickly revealed the first obstacle that I needed to overcome.

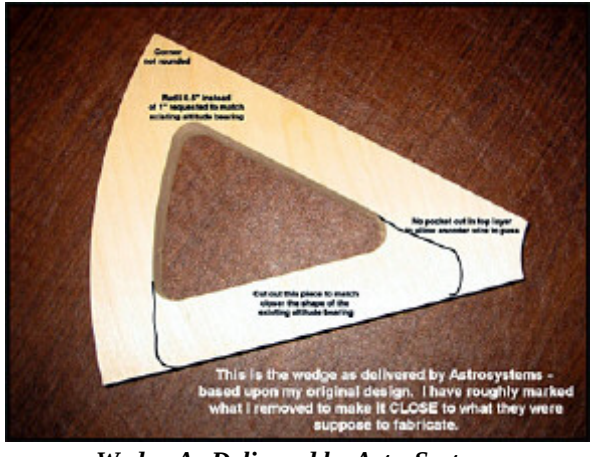
The two springs provide the necessary tension to hold the drive wheel against the edge of the round groundboard.

With the azimuth drive installed, attention turned to the altitude assembly. A new problem surfaced. Most



Groundboard and Azimuth Drive Wheel

Dobs have their altitude bearings separated by 60-70 degrees; but those on the TeleKit were separated by 90 degrees. With the scope aimed at either the zenith or at the horizon, there was no altitude bearing pro-



Wedge As Delivered by AstroSystems

Finished Wedge Installed on Mirror Box

jecting above the Teflon pads. This is critical, as the drive cable must contact the altitude bearing as it leaves the drive wheel. I had to devise a solution. I drew a side view of the rocker and mirror box using AutoCAD, and developed a "wedge" to lengthen the altitude bearing.

I sent the file to Randy at AstroSystems, and within three weeks I had the prototype in hand. It wasn't made exactly like the drawing.

But, I was able to modify it to be close to what I had designed. I cut out the portion of the wedge that I didn't want and rounded over all edges. I then sealed and varnished the wedge and screwed it onto the mirror box. The rest of the altitude cable drive installation went according to the instructions.

I had previously made a laptop table that mounted to the rocker using the wheelbarrow handle T-nuts. However, now that the altitude drive had been installed, I needed to modify the leg on my laptop table. The alti-

Altitude Motor Drive Cover

tude drive motor was right in the way. I fabricated a box out of ¾" Birch plywood to encompass the drive and removed a piece of the leg to make a place for it. It helped keep the aesthetics of the TeleKit.

With all problems solved, I was now ready for my first class in "brainless astronomy".

Due to the long stretch of bad weather that plagued

TeleKit with ServoCAT, Laptop Table and Tag-Along Battery Supply

the gulf south for most of the summer of 2003, I was not able to test the ServoCAT until Monday, September 15th. The wait was worth it! I set up the scope before dark, and by 8:00 PM, I was able to align the Argo Navis on Vega and Altair. For the next 90 minutes, the ServoCAT guided the scope to over 30 objects (one every 3 minutes), and all targets fell within the center of the 100X field of view of my 20mm eyepiece. Once

the targets were found, the ServoCAT followed them. I tested the tracking on The Blue Snowball for 10 minutes at 300X – the CAT passed the test. Prior to the CAT, observing at high powers was a problem. Constant re-adjustment of the scope to allow the object to track across the field of view did not allow for intense scrutiny of the target. This also presented a problem at stargazes. I would have to constantly climb the ladder to place the object in the field for the next observer. Now with tracking, subtle detail that could not be detected without tracking is now seen.

If you have any questions on my TeleKit, the ServoCAT, or my laptop table, you can contact me at: jhuerkamp@bellsouth.net

Additional information on the construction of my TeleKit and the modifications I have made to it may be seen on my website: http://www.WaningMoonII.com

Jamaican Eclipse

While anchored off Jamaica in 1504, Christopher Columbus found himself in dire straits. Though his supplies were running low, the Jamaican Indians refused to sell him any more food. Consulting his almanac, Columbus noticed that a lunar eclipse was due a few days later. On the appointed day, he summoned the Jamaican leaders and warned them that he would blot out the moon that very evening if his demands for food were not promptly met. The Jamaicans only laughed at him - until later that night when the eclipse began. As the moon disappeared before their eyes, they visited Columbus in a state of terror, whereupon he agreed to stop his magic in exchange for food. The offer was accepted and the moon "restored."

Cosmic Foresight

There exist five Platonic solids of perfect symmetry. Three (the tetrahedron, octahedron and icosahedron) have triangular faces. One (the cube) has square faces. And one (the dodecahedron) has pentagonal (five-sided) faces. Plato believed that the first four solids corresponded to the four elements of which the world was thought to be composed: earth, air, fire, and water. The dodecahedron, however, corresponded to "quintessence" - the element, according to Plato, of which the heavens were made. "God used this solid for the whole universe," he declared, "embroidering figures on it."

Fittingly, in October 2003, Jean-Pierre Luminet and his colleagues at the Paris Observatory published a paper in the esteemed journal Nature arguing, on the basis of data collected by a satellite called the Wilkinson Microwave Anisotropy Probe (WMAP), that the universe is, in fact, a dodecahedron!

Hsi and Ho

The first report of a solar eclipse appeared in Chinese records. The eclipse came without warning, according to legend, because the royal astronomers, Hsi and Ho, were too drunk to make the necessary computations. For this dereliction of duty they were promptly executed.

Aptly-Named

The event horizon of a black hole defines the range within which gravitational forces exceed the ability of energy of any kind (including light) to escape. The defining boundary of this critical region (often envisioned as a "shield" enclosing a "black" interior) was fittingly named the Schwarzschild radius, after German astronomer Karl Schwarzschild. Incredibly, his surname literally means black (schwarz) shield (schild).

the ancient astronomers of newgrange

By Anthony Murphy

Loughcrew

Before we finish our wonderful exploration of Stone Age astronomy, we must leave the Bend of the Boyne for a moment and turn our attention further west, towards the hills of Meath at a place called Sliabh na Cailaighe, the Mountain of the Hag, at Loughcrew. Here, scattered on the peaks of the Carnbane hills which overlook some breathtaking scenery, are a group of Stone Age cairns which may be even older than their Boyne Valley counterparts.

This is a highly-decorated stone in the end recess of Cairn T at Loughcrew. At the spring equinox a beam of light from the sun illuminates some of the features of this stone.

It was here, at one of the cairns called Cairn T, that Martin Brennan made a discovery in the Spring of 1980 that was to put him on the front page of newspapers across the world. Cairn T, at over 900ft above sea level, stands in the central position and takes the most prominent place on the highest summit of a megalithic area that may once have contained as many as fifty to a hundred cairns. It was March 17, 1980, and Brennan and his friend Jack Roberts had just arrived at Cairn T after a drive from Dublin. This was the latest in a string of attempts to see the sunrise, but adverse weather conditions that Spring meant they had not seen one single sunrise since March 1st.

Here is Brennan's account of what happened:

"*We were winding up the mountain road when the disc of the sun broke on the horizon. We felt as if we were ten minutes late for an appointment made over 5,000 years ago. The lock on the modern door leading to the passage had frozen during the night, and as we struggled with it the rising sun was already above the horizon. When we drew back the door a narrow chink of light streamed down the passage and flashed into the end recess of the chamber.*"

"*On the upper left of the backstone a rectangular patch of light was rapidly beginning to take form, brilliantly illuminating the entire chamber in a growing splendour of shimmering golden orange light. It was dazzling, and when we entered the chamber we stood back and gazed in awe.*"

"*The light assumed a clearly defined geometric shape that was projected on to the upright backstone and moved diagonally across it, tracing the path of the sun against a mural of prehistoric art. What impressed us most was the careful and delicate modelling of the light beam by the huge stones forming the passage and chamber, and how the shape of the beam conformed to the patterns engraved on the stone. For the first time we were seeing the signs and symbols in the context in which the artist had meant them to be seen.*"

Brennan said it was clear that they were dealing with a

solar construct capable of defining an individual day with far greater precision than Newgrange. The wider differences in the sun's apparent movement at equinox made it considerably easier to define the actual day of equinox at Cairn T than the day of Winter Solstice at Newgrange. Coupled with the help of the rock engravings, this created a remarkably precise astronomical instrument.

The Equinox Stone: The beam of spring equinox sunlight strikes the 'daisy' at top left and follows the zig-zags towards the next daisy-like feature.

The stone which forms the ceiling of the end recess of Cairn T is also beautifully adorned, and contains a number of star-like and sun-like patterns. This stone, too, would receive reflected light on the morning of the equinox. Crouched in the small recess, with one's face to the entrance and one's back to the beautiful equinox stone, looking up at the ceiling gives one the impression of looking at some kind of star map or astral guide. Sunwheels, most notably those with 8 radials, echo the pattern of sunwheels on the equinox stone. This highly-decorated stone, along with one on the ceiling of the east recess at Newgrange, was engraved before being positioned above the recess.

The wonderful ceiling stone of the end recess of Cairn T. The plethora of carvings give one the impression that the stone is supposed to serve as some kind of star map or astral guide. This stone is illuminated during sunrise at Spring Equinox. It is located directly above the 'Equinox Stone',

Some of the passage stones at Cairn T are adorned with huge numbers of round holes, or cup marks, and give the impression of some form of primitive star map.

Another interesting aspect of the Cairn T alignment is the fact that when you look out from the end recess through the entrance, the distant Hill of Slane can be seen in the centre of the view. In other words, the Spring Equinox sunrise viewed from Loughcrew Cairn T rises at Slane. Was this another intentional alignment? Is it merely coincidence that Saint Patrick was later to light his Easter fire here, and that Easter is calculated using the Full Moon closest to the Spring Equinox? Also coincidental is the fact that St. Patrick's Day is celebrated three days before the Spring Equinox in modern times.

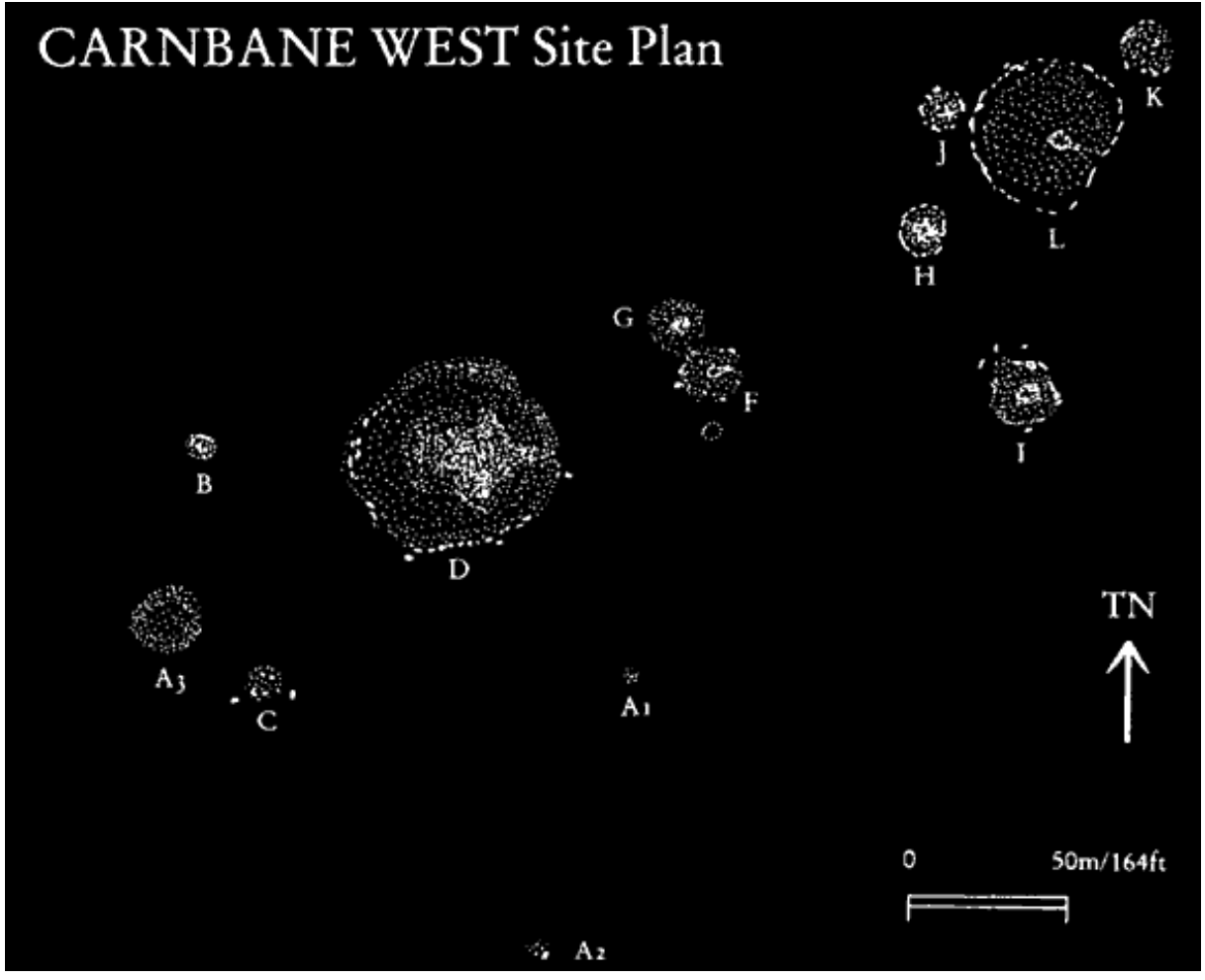
There is a large mound on the peak of the Hill of Slane, although many visitors do not see it because it is

shrouded in a clump of huge trees and access is difficult. This mound was said to have been the burial place of the Fir Bolg king Slaine, who reigned in the ancient province of Ulster, which at that time was the largest of the five provinces in the country. His territory was bounded to the south by the River Boyne, which in ancient times marked the border between the provinces of Ulster and Leinster.

It was in Drogheda, at a mound known today as the Millmount, that the mythical Milesian rulers Eremon and Eber divided the island into two kingdoms - one north of the Boyne and one south. The mound later became the burial place of Eremon's brother, the bard and astronomer Amergin, who famously chanted these lines when the Milesians first landed at the Boyne Estuary:

"*What land is better than this island of the setting sun?*
Who but I knows the place where the sun sets?
Who but I can tell the ages of the Moon?"

It seemed that Amergin and his brothers were well aware of the Boyne River's long-established link with astronomical study. Another curious alignment worthy of mention brings some of these ancient sites into focus. A line drawn on an ordnance survey map from Millmount through the Slane mound can be traced with reasonable accuracy as far west as Loughcrew, and specifically Carnbane west which contains a number of neolithic sites. If this supposed alignment seems imaginative, it gains credence when one considers that from Millmount, Winter Solstice sunset occurs exactly in the direction of the Hill of Tara and another ancient mound, the Mound of the Hostages.



Carnbane west, the apparent target of the alignment, contains the biggest Cairn of all the cairns at Loughcrew, called Cairn D. But it is a nearby heap of stones, Cairn L, which attracts more astronomical interest. It is inside the chamber of Cairn L that on the November and February cross-quarter days, sunrise penetrates into the chamber and illuminates a 6-foot tall white standing stone.

The highly decorated, but exposed, surface of stone 14 at Cairn U, beside Cairn T at the summit of Carnbane East at Loughcrew. Cairn U has a circumference of 48.2 metres, and the passage is oriented to 108 degrees (18 degrees south of east).

This event was first rediscovered by Brennan on November 3rd, 1980. He describes it thus: "*A flash of light pierced the darkness of Cairn L and illuminated the top of the standing stone. Instead of the usual slow, progressive entry of the beam of light, it had penetrated the chamber instantaneously.*" He said the beam of light was modeled so that it struck only the standing stone, and no other stones. He had witnessed precise astronomy at work, some 5,700 years after this Stone Age timepiece was put together.

There are other alignments at Loughcrew too. The direction of Summer Solstice sunrise is marked by the lining up of four sites - Cairns P1, R2, T and U. Cairn I, which points to Cairn T, can be used to track the sun as it makes it way towards the equinox, while cairns S and U are aligned on the cross-quarter day sunrises, Cairn S on May/August cross-quarter, and Cairn U on November/ February cross-quarter. Moonrises have also been observed at Loughcrew, and the most interesting of these is the Harvest Moon in August which shines into Cairn L and strikes stone 13 at the back of the end recess.

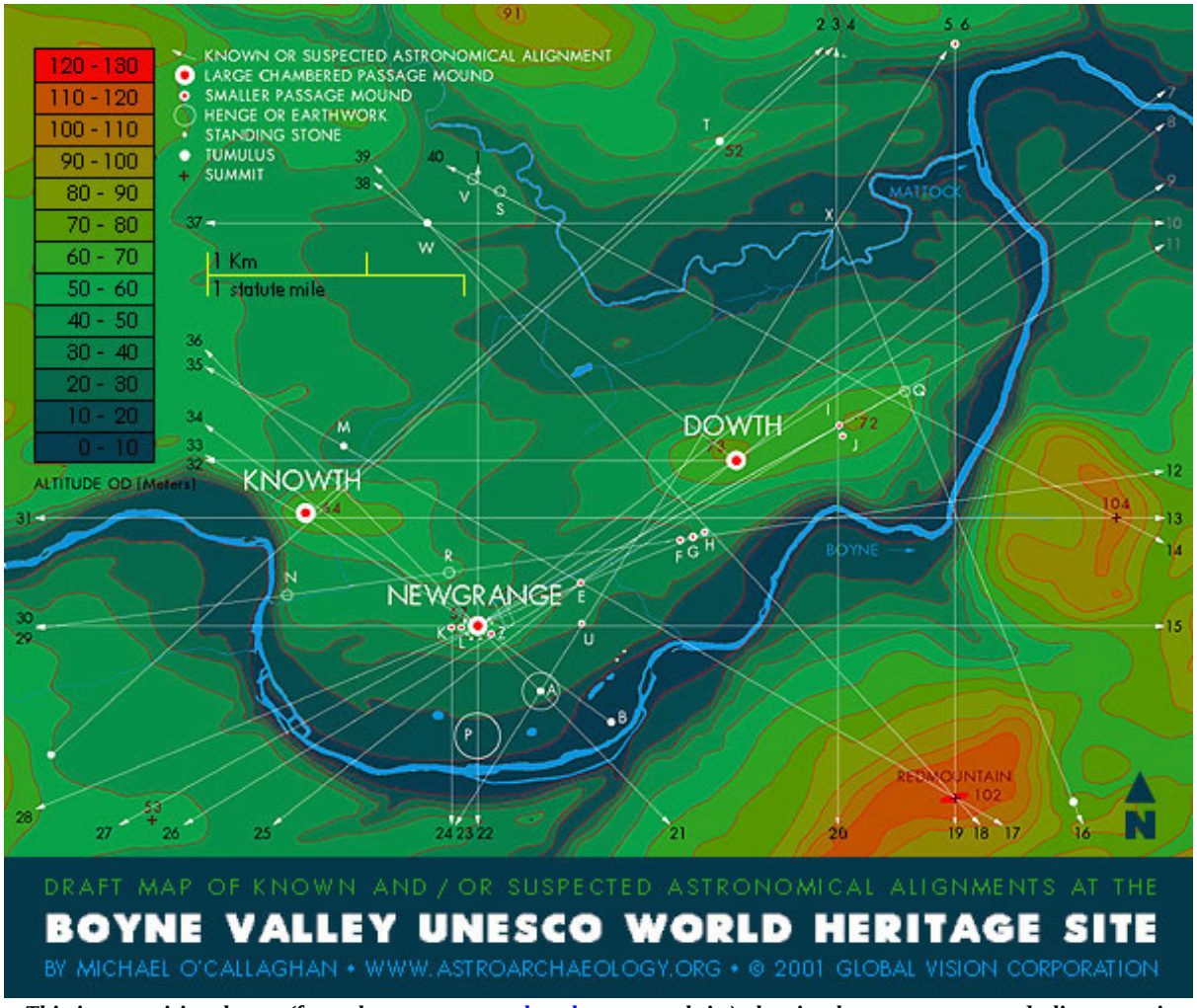
Baltray

Before I conclude, there is one more site worthy of a mention. It is at Baltray, a village at the Mouth of the River Boyne, where we meet two megalithic standing stones, which have stood as silent sentries watching over the estuary for thousands of years. The larger of these two standing stones has a very flat, straight edge, which myself and two friends discovered had a very unique alignment.

The stone points to two small islands out in the Irish Sea, called Rockabill, which in modern times have a lighthouse on the larger of the two islands. In December of 1999, we confirmed, after much speculation, that this was the location of the rising sun at Winter Solstice as viewed from the Baltray standing stone.

The alignment is a bit off in this epoch though, and the sun's rising position has drifted to the left in the years since the stones were erected. We are not sure exactly when the stones date to, but we suspect they are early indeed, perhaps as early as the Late Neolithic, which would place their construction some time between

The large Baltray stone photographed on the evening of June 17th, 2000, just four days from the Summer Solstice. Observations made on this evening confirmed that the stone does mark Summer Solstice sunset, as well as Winter Solstice sunrise.



This is a provisional map (from the www.astroarchaeology.org website) showing known or suspected alignments in Brugh na Bóinne. Visit this page to see details about each of the alignments. Alignments numbers 2, 8, 9, 11 and 25 have all been independently observed and verified for this project by the Mythical Ireland team.

3000 and 2500 BC. At least one prominent archaeologist has agreed that this might be the case. We know at Newgrange, thanks to the work of Frank Prendergast and Tom Ray, that the sun's rising position now is a whole degree, or two sun widths, to the left of where it was when Newgrange was constructed, and it is clear that at Baltray the sun's rising position is at least one and a half sunwidths left of Rockabill. We would prefer to leave it to the professional archaeoastronomers to tell us exactly when the stones date to, but it is sufficient to conclude that the alignment is of major importance.

This is the first major archaeological site one would encounter on a journey up the Boyne River, and because of the major astronomical theme of the many Stone sites along the river, it must be considered important that the very first site has a Winter Solstice sunrise alignment just as Newgrange does. These stones would have been important as a boundary marker in ancient times, marking the border between the ancient provinces of Ulster, to the north of the Boyne, and Leinster to the south. Legend tells us this is the strand where Cuchulainn met his son Connla for the first time and the two fought on the shore of the sea under the standing stones before Cuchulainn slew his son in the shallow waters of the incoming tide.

The stones may also have been used to track the position of the Moon, as is suggested in another myth about Rockabill which tells how the Sun god, Balor, was once trying to steal the magic cow, the Glasgabhlin, from Ulster. This cow, the story says, had an everlasting supply of milk. I have tentatively linked this cow with the Moon, and the calf with Venus, suggesting that the astronomical purpose of the stones is more complex than meets the eye. Read more here: The Baltray myth.

Unfortunately on this occasion there was some cloud on the eastern horizon despite generally clear skies overhead. This meant we could not record the actual rising position of the moon, but as can be seen from the above picture, the moon's position is nearly coincidental with that of the Winter sunrise. For this photo I was positioned about 30 feet northwest of the large stone, so we are viewing it almost edge-on.

Conclusion

To the casual or foreign visitor, there is something awe-inspiring about the huge megalithic sites of the Boyne region. Very few people leave Brugh na Boinne without having felt some deep connection with the ancient past, and fewer still leave without a clatter of questions on their mind about the original intent and purpose of these sites.

For the astronomer, these are surely exciting places to be. In one moment, an amateur astronomer visiting Dowth or Loughcrew or Fourknocks or Newgrange can bridge up to five and a half thousand years of history. For just as we today gaze at the heavens and watch the sun, moon, planets, and stars, so too did our ancient ancestors. Of that, we are now pretty sure.

Something of a consensus is beginning to form, even in the more conservative areas of archaeological and anthropological academic research, that much of what the people of the Irish Neolithic were about involved some form of heavenly study or knowledge. The field of ancient astronomical research, once left almost entirely to amateurs, is now very much a part of professional study of these sites.

And this is a good thing. If we can begin to look at our ancient sites as being connected, whether astronomically or otherwise, we can begin to see the Cosmic landscape, in much the same form as it was originally crafted, by people who felt a connection with the Cosmos in a much stronger and definite way than we do. We may have discovered more planets, put a man on the Moon and seen into the furthest reaches of space with our telescopes, but we have lost something too - a simple, but beautiful, relationship with the heavens which understands the harmony of the sun and the seasons, the moon and the tides, and their movement among the stars which reveals the longer ages in which things slowly change.

The astronomical landscape functions on more than simply one or two levels. It is what I call three-dimensional, and each site demonstrates this perfectly. At Newgrange, to take the most famous example, some would believe that it is a device for tracking down the Winter Solstice. That is not the full picture. Newgrange is a complex astronomical and calendrical device. The people who constructed it knew this better than we do, and could probably tell exactly what day of the year it was simply by looking at the way the sun casts shadows on the stones. We have taken that simple observation away, and replaced it with wristwatches, and calendars, and computers and a host of devices and aids with which we can tell the day, or season, or year.

The people who built Newgrange, and Knowth and Dowth as well, were very familiar with the lunar cycle. We know they studied the Moon's cycle because they wrote about it on the stones, in a language which seems vague and complex, but which can be interpreted symbolically by those who care to look hard enough.

And our understanding of their exact level of knowledge is still poor. There remains much work to be done. In this series of articles, we have seen an astronomical interpretation of three or four kerbstones at Knowth. There are 127 in total, and many more decorated stones in the passages.

Maybe at some stage we will know and understand, and see the universe in much the same way as the megalithic astronomers. Until then, the journey of discovery and enlightenment is an exciting and fulfilling one.

- In Search of Ancient Ireland: The Origins of the Irish, from Neolithic Times to the Coming of the English
- The Stones of Time: Calendars, Sundials, and Stone Chambers of Ancient Ireland
- Ancient Ireland: An Explorer's Guide
- Newgrange: Archaeology, Art and Legend
- In Search Of Ancient Ireland (DVD)
- Treasury of Irish Myth, Legend & Folklore

THE 2005 TUCSON METEORITE SHOW

By Mark Bostick

Tucson International Airport sounds bigger than it is. As I stepped out of it's door on Wednesday afternoon, I was pleased to see the sun shining and an almost cloudless sky. The 65 degree forecast for the day from one of the morning news programs proved true. A threat of rain still lingered through the weekend, but compared to the icy and snowy Wichita, Kansas I left behind, it was hard not to be happy. The many meteorites and meteorite people in town didn't hurt either.

Sign posted on one of the Inn Suites Dealer Information boards. "E.T. IS HERE!" We were warned. (Mark Case has done several meteorite pieces for me, he works while selling at the Inn Suites every year, check him out next time).

This year I had reserved a room at the Vagabond, now known as the Arizona Plaza. It is a game they play in Tucson. Perhaps even a local law. No hotel can keep the same name for more then two years in a row. Combined with streets that change names, it is hard to call it visitor friendly. I arrived at my hotel a little after 3 p.m. and my room was not quite ready. Fortunately, the Best Western Executive Inn was across the street and once again Al Lang had what is now becoming his normal room, split into two show rooms, in that location. Lang's helper, "Z", let me leave my larger luggage there, which let me be more portable, now carrying only my smaller bag.

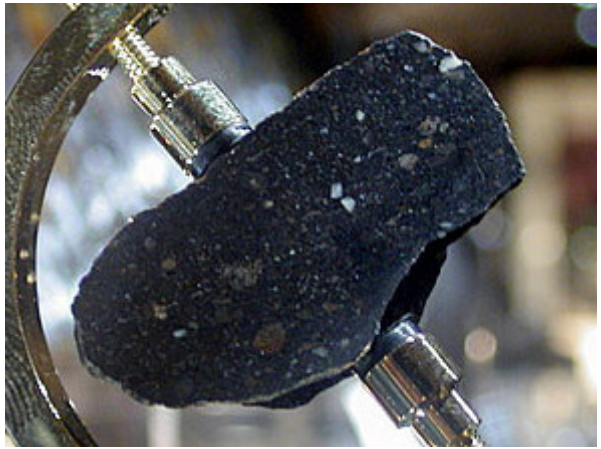
The Inn Suites has always been the center of meteorite activity - this year was no different - it was my first official show stop. In the front of the Inn Suites, with truck and tent was Denver C.O.M.E.T. member Fred Olsen. Fred carried with him a sample of a new Colorado meteorite. A nice looking stone that will be described at a later date.

Set up at the Inn Suites (listed in no order) was Edwin

Mike Farmer, Anne Black and Eric Olsen. Farmer and Olsen room at the Inn Suites

Thompson (E.T.), Marvin Killgore, Alain Carion, Michael Farmer & Eric Olsen, Michel Franco, Bruno and Carine, Eduardo (Meteorites.com), the Labenne's and Ahmed Pani. Combine this with many meteorite collectors and some of the most interesting stones at the show. If you were looking for a meteorite conversation, look no further. I know several of the non-meteorite dealers in the hotel so I usually spend a lot of time in this area.

Mike Farmer and Eric Olsen had once again set up together. While I am sure it needs no comment here, the highlight of this room was Mike's recent lunar find. The meteorite is shaped somewhat like a fat finger, or appeared as such in its current cut state. The meteorite was found less then a month before the show and confirmed as lunar a couple days before I made it to Tucson. It looks more like a carbonaceous than a lunar to me, but the crystalline structure in the thin section photo Mike showed quickly rules that out. Together, Mike and Eric had a nice assortment of meteorites and



Mike Farmer's new lunar find. Congratulations Mike!

related items. I left with a nice small part slice of Fortuna. Fortuna was a small 312 gram winonaite from Argentina that was mostly traded into museums. Very little is in collectors hands and this was Mike's last slice. Eric tempted me into buying a bag of Aouelloul glass and in the fictional land of no-end-budget, I purchased the large Camel Donga that screamed "take me home".

Alain Carion, sporting his standard sweater vest attire, had with him tables of impactite and meteorites. Carion has always been like the king of Libyan glass. One nice sample Anne Black pointed out to me had several interesting dark linear inclusions. Photos of Carion's recent Egyptian trip to a newly recognized impact structure flickered across his computer screen upon request. This was an official government sponsored trip so unfortunately no impactite samples were available for sale, but I enjoyed the photographs and I am sure others did as well. Some of the shatter cones were well defined and quite large, which makes me think the impact happened more than a million years ago, which appears to be the time limit for finding meteorites. Marvin Killgore had the best looking display cases and some of the best meteorites in the show. A few items of interest this year included a new book, this one on thin sections, which should be both needed and welcomed by all, the new Chinese Pallasite, and a neat lighted display featuring a augrite thin section in poster size proportion. Every year, I look at the, if I dare say it, "cute" Gascoyne Junction (G.J.) meteorites Marvin has. Picked out of the Australian desert by Marvin and his family, G.J. was his daughter's first meteorite find. This year I managed to talk myself into getting a 63 gram individual. It was now happy hour at the hotel, so I did a Jim Strope. That is, go to the bar and request free drinks which they give to the hotel guests. They never ask for room keys or the like.

On friday morning, I found meteorite collector Bob King, who had teamed up with a Canadian, whose name I can't remember, but was suffering from a lack of Starbuck's coffee, in my hotel lobby. After sharing a "continental" breakfast, we decided to hang together a little while and make our way to the Smugglers Inn, where Comet Meteorite Shop was this year. The Smugglers Inn was six-to-seven miles out of the region of most of the show hotels. And I imagine their final sales showed this. Very few buyers could be found walking around this hotel, despite the fact that this location seemed to have better than average show prices.

At Comet Meteorite Shop, Sergey and his friend carried with them an inventory that one might consider basic for the Russians. Brahin pallasite slices, Chinga (slices and individuals), assorted Russian impactites, some of Sergey's Oman finds and of course, several trays of Sikhote-Alins. While attempting to sort out all of their baby heat shield meteorites, something I tend to do every show, I noticed a Sikhote-Alin with flow lines

Sergey of Comet Meteorite Shop at the Smugglers Inn

galore, including some that were very deep. Bob King found a neat little oriented SAU 001 meteorite with a gold tint to its bottom. Perfect little stone Bob.

From there, we made it back to the Inn Suites. This time I found my way to the respective rooms of Ahmed Pani and Edwin Thompson. Ahmed had some neat meteorites including some large fresh NWA howardite slices, which caught the eye of Bob King and his roommate. I found a tray of Sikhote-Alins, so once again I sorted through them for heat shields. I must have over 100 Sikhote-Alin heat shield shaped meteorites in my collection and you would think that would be enough...you would think. My efforts were rewarded with a nice oriented one. If you can't tell, I seem to like "Sikhotes".

With all the hustle of the Tucson show I had somehow managed to miss E.T.'s room at previous shows. Something that might bring him to the wrong conclusion that I dislike him. E.T.'s showcases were filled with

Edwin Thompson "E.T." in his room full of great deals

both classic and recent meteorite finds and falls all at fair prices. Allen Hills 79001 and Murchison at $50.00 a gram. A C3 anomalous at $5.00/g, seemed to be the best deal in the room to me. This meteorite had a nice orange tinted matrix of large chondrules. Perhaps I will try to e-mail E.T. for a piece after the dust settles and my wallet fattens a little more.

New to Tucson, Michel Franco had with him a nice assortment of meteorites he labeled as finds. Irons, chondrites and achondrites have all found their way under Michel's metal detector. Two of the meteorites he recovered in large lots from strewn fields included a CV3 and an L-chondrite like NWA 869, or its many synonyms. Michel had these labeled, appropriately, from the location they were found, and I will be interested to see if these names are approved. His CV3's were very well priced and I picked out a nice 118g individual. Michel had several nice achondrite slices and a very large diogenite that he managed to sell. It was both a good buy...and good sell.

Friday night was the Fossil Co-op dinner, which was raided by much of the meteorite community. The dinner tables were set up next to each other in a line that went down the warehouse-like building. I sat with Fred Olsen and the Hupe brothers. The Hupes were in positive mood as normal, and we talked NWA's over an Italian dinner washed down with beer while they auctioned off wine bottles. Next to the Fossil Co-op, is the Arizona Plaza, were I made home in Tucson, and the location of the Birthday Bash/Harvey Awards.

Rob Woolard and his wife sat in the hotel lobby and waited for the birthday bash to begin. This gave us time for a little conversation about Woolard's recent trip to Oman with Mike Farmer. The trip that recovered the new moon rock. Woolard's love for meteorites is obvious and I look forward to reading more about his and Mike's adventure.

The Birthday Bash and Harvey Awards, as normal, was a highlight of the show. (Thank you Geoff Notkin and Steve Arnold). The first few of us in there decided to move the tables closer together and it wasn't long before the drinks started flowing. The awards were pleasant, Notkin taking the familiar role of lead presenter and I was pleased to see Michael Blood and Art Elhmann receive Harvey Awards. After getting 4-5 drinks in me, I foolishly tried to play a few games of chess with a very sober Fred Hall and pretty much got slaughtered each time. I don't think chess tournaments have drinking leagues, and now I know why.

On saturday I felt quite sick and never left the hotel..other than to recover my travel bags. I am not sure what it is with Tucson, but the town seems to make me sick. It's not good to be in public when you're ill as everyone you come in contact with says, 'Hey, you look sick." The flu, or whatever it was, was gone in

Michel Franco with one of his finds, Inn Suites Hotel

~30 hours, and since I was in Tucson for several days, it didn't stop me from spending any money, but it did keep me from attending the two auctions on Saturday.

Sunday saw the main Lang auction at the Westward Look Resort. I made my way to the hotel with Peter and Jason Utas, a father and son meteorite team from California that are successful meteorite hunters and highly respected in our community. (Thank you guys for buying me lunch).

Lang always seems to put together a collection of auctions so nice I want to bid on all of them. However, my funds were now getting short and so I just sat back and played witness. Here we were greeted to a black suited and bright tied Geoff Notkin, our auctioneer. Notkin did a great job keeping the lots moving and sorting through the pre-auction bids. After the Lang auction, we were treated to a talk by Apollo astronaut and moon walker, Harrison "Jack" Schmitt. Schmitt played a small NASA movie, which included moon foot-

Earth's Memory Carine (taking a photograph of me), Bruno and Adam Hupe. From unlevel courtyard...:^)

age and answered questions, before and after the event. Schmitt was friendly and shook many hands while answering questions. A friend of mine asked for an autograph, which Schmitt not so kindly refused. I have always been amazed at the many people that take on a celebrity role, as long as it financially suits them, but turn bitter when they get a request for an autograph.

As the Superbowl pre-game show was winding down, I finally made my way to Blaine Reed's new room at the Ramada Limited. Formerly the La Quinta (remember the name change rule!). Blaine had a larger variety of material this year (mostly consignment), which filled the tables and, as normal, the end of the bed. David Gregory as well as Dorothy and Richard Norton made there way through the room during my visit. I chatted with Dorothy while Richard and a geologist friend of theirs looked over Blaine's eucrites. Me and Dorothy have both produced meteorite comics, mine much less politically correct then hers. Like a mother, she gave me a little-earned scolding without actually saying it.

I returned to my room as halftime was winding down and for the first time since coming to the Tucson shows, I had managed to watch most of and the end of a Super Bowl game. The Patriots won and my meteorite blow money spent, the weekend was predictable.

Overall, it was likely the biggest Tucson meteorite show, people-wise, so far. We had more sellers and more buyers. Lots of meteorites were traded and sold and even a $250,000 check was signed. Sadly, not to me. Make your plans for 2006.

Trends I noticed at the show: Tektites are getting harder to find and everyone wanted more this year than in previous years; lunar and martian meteorites seem to have leveled out in price; Howardites, carbonaceous and urelites, were seen everywhere, and cheaper than in previous years; there were less Moroccan sellers with meteorites, in fact a lack of them, which reflects what everyone has been saying. Africa is drying up.

Fellow collectors and dealers I noticed around the show, and not mentioned above include, but of course

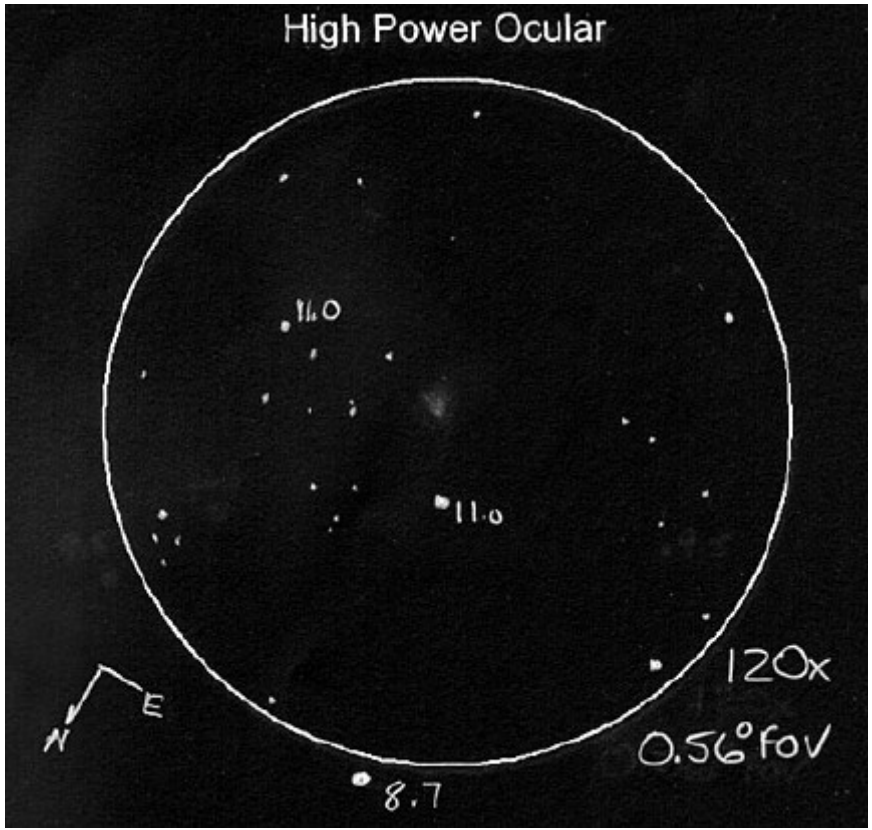
Bob Holmes and his Amagala with clear brecciation

are not limited to; Mike Jensen, Rob Wesel, Jason Phillips, Jim Kreigh, Twink Monrad, Mark Bowling, Matt Morgan, Steve Arnold (Chicago), Bob Hagg, Erich Reider, McCartney Taylor, Bob C., Martin Horejsi, Stan (Sorry, don't know Stan's last name), John Sinclair, David Weir and Maria Haas.

Mark Bostick's site: http://www.meteoritearticles.com

The Long Night of the Comets!

By Mark S Deprest



Comet 29P Schwassmann – Wachmann

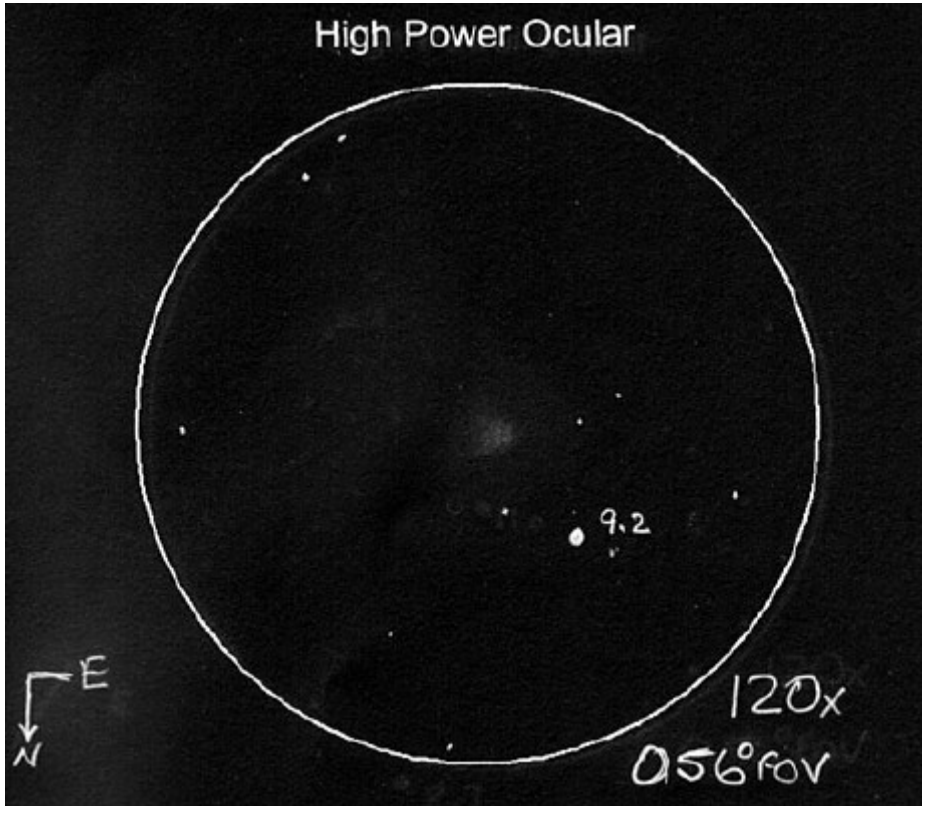
I have had observing sessions that I will never forget, and I have observed from darker sites. I have had sessions that lasted until daybreak, and I have seen many fascinating comets before. I have seen things with my scopes that others had doubts about, and I have spent hours futilely searching for objects just beyond my reach.

But on the night of Saturday, November 13 and the early morning hours of Sunday, November 14, I experienced a night that will be added to; (with extra asterisks) "The Best of" list. First of all it was mid-November and it was clear, it was also a New Moon week-end. Secondly, I realized that given the right conditions (very good transparency), I could observe 6 comets in one session; albeit some of those 6 would be very faint. Ah, but I have seen very faint comets before, and according to the most recent information (from the Yahoo "comet-m1" group) some of these comets were brighter than their elements would suggest. This incredible session took place at Peach Mt. Observatory, in Dexter Township, Michigan, USA, the home observatory for the University Lowbrow Astronomers (http://www.umich.edu/~lowbrows/).

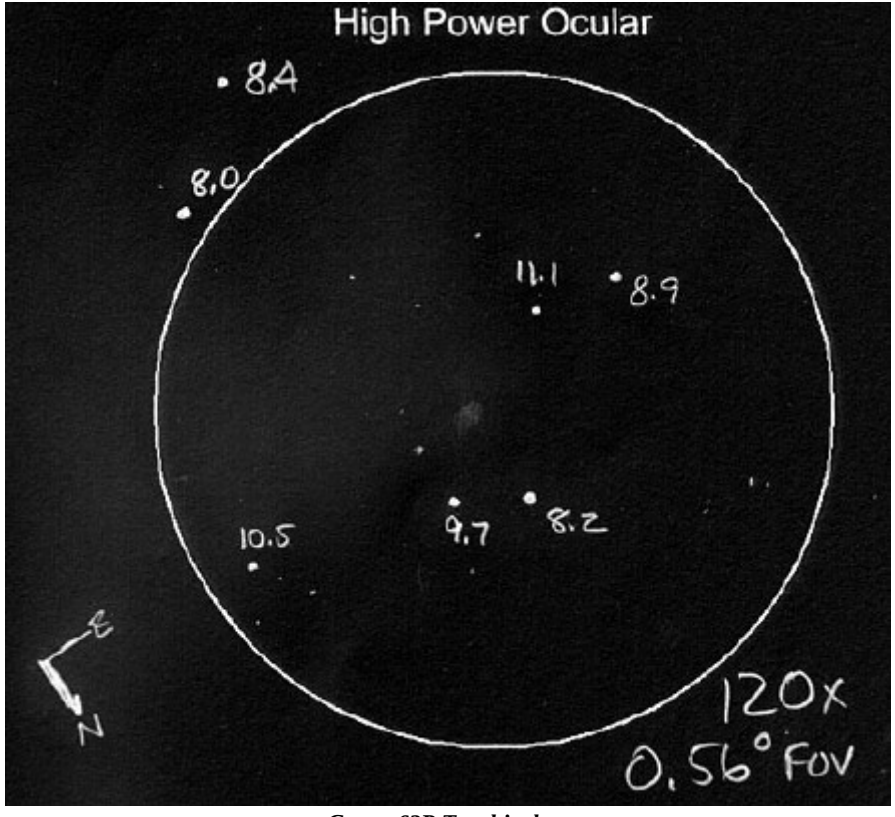
So with that in mind and the overconfidence I possess, I first downloaded the latest orbital elements and using Guide 8.0 by Project Pluto, I printed six wide-field (20 degrees) finder charts and six highly detailed, 2.5 degree, inverted field of view charts. I always make sure to include any deep-sky objects at least two magnitudes dimmer than my intended target on these 2.5 degree charts, in order ***not*** to confuse some other faint fuzzy with my comet. I also like to include magnitude listing for the stars down to about 10.5, this helps me when I try to estimate a comet's over all magnitude and finally I invert these highly detailed FOV charts to match my telescope & eyepiece view. I'll admit it, I've always had trouble mentally flipping my actual field of view (FOV) to match most finder charts, and that is one of the reasons why I prefer a "Telrad-Finder" to the more conventional finder scopes which really do weird things to the view and my head.

My targets, according to Guide 8.0, for this session would include C/2004 Q1 Tucker at 13.1 magnitude, 78P Gehrels at 11.6 magnitude, 32P Comas Sola at 13.5 magnitude, 29P Schwassmann – Wachmann at 15.0 magnitude, C/2004 Q2 Machholz at 7.3 magnitude and 62P Tsuchinshan at 12.8 magnitude. Now I know the first thing you're thinking is that there is no way to see comets as faint as the magnitudes listed above with a 12.5" f/5.6 reflector from a site like Peach Mt., which is located just northwest of Ann Arbor, MI and if

you weren't thinking that then, you probably are now. Well, let me explain some things about the numbers I just gave you. First thing you need to remember about comets is that they are notoriously difficult to predict, as David Levy has said "Comets are like cats, they both have tails and they both do exactly what ***they*** want to!" Secondly, remember that I said the most recent information showed that these comets were brighter than their elements would suggest. I also read recently that comet 29P Schwassmann - Wachmann was in outburst, this happens periodically to comets when they tumble and a new area of their nucleus is exposed more directly to the charged particles streaming off the sun. That newly exposed area can sometimes become very active and can brighten a comet's overall magnitude by many orders of magnitude. Position in the sky, surface brightness and size are large factors in determining whether or not you will be able to see a particular extended object like a comet. For instance, a small, high surface brightness, comet placed overhead would be considerably easier to see than a large, much diffused (low surface brightness), comet only a few degrees above the horizon.

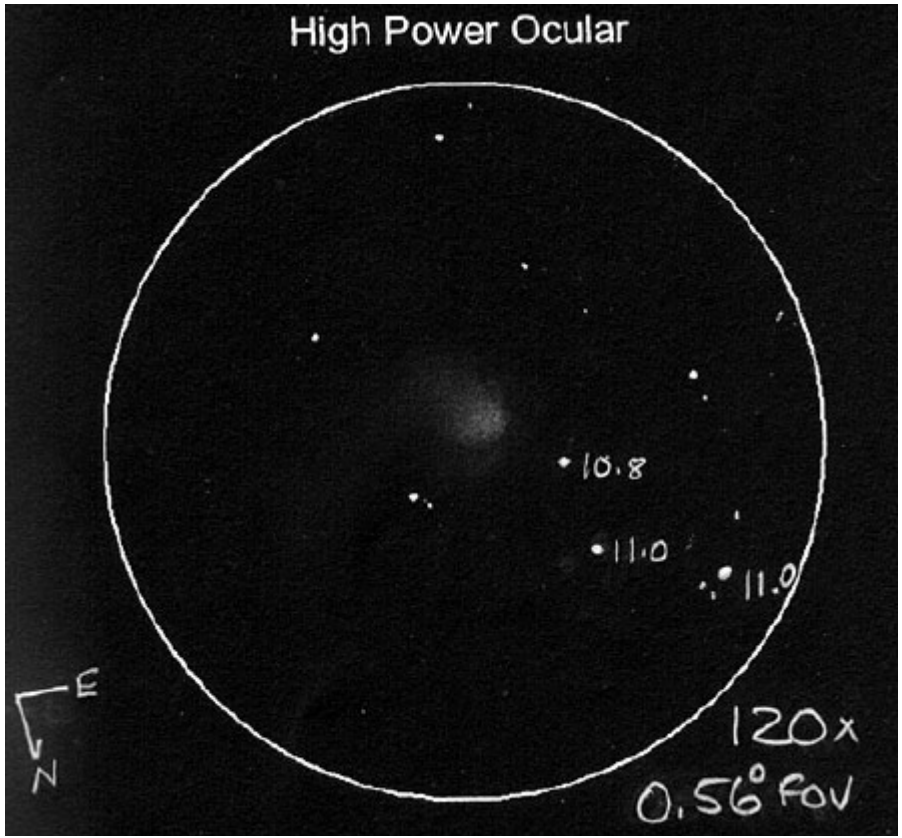


Comet 32P Comas Sola



Comet 62P Tsuchinshan

So, let's get back to the ambitious list of comets that I planned on trying to see this night. I like to check Seiichi Yoshida's website (http://www.aerith.net) for some of the most accurate, up to date and practical information on comets. His website for November 13, 2004 listed; C/2004 Q1 Tucker as 10.4 mag., 78P Gehrels as 10.3 mag., 32P Comas Sola and 29P Schwassmann – Wachmann as between 12th & 13th mag., C/2004 Q2 Machholz as 6.9 mag., and 62P Tsuchinshan as around 12th magnitude and that puts all of these comets within my reach even if only in theory. Next we need to look at when the best time to attempt finding these elusive objects would be based on where they are, in the sky and pull charts for those times, after all comets move against the background stars and a chart pulled for one time would not be as accurate if you were trying to find the comet at a different time. Tucker was near the Andromeda / Pegasus border and only slightly more than 1 degree southwest of the 4.5 mag. Sigma Andromeda this would be highest in the sky about 21:00 EST, so goes charts 1 and 2. Gehrels and Comas Sola were tucked away in the southern most corner of Aries near the borders of Taurus and Cetus respectively, with Gehrels being 3.7 degrees west of 4th mag. 5 Taurus and Comas Sola only 1 degree east of the 4th mag. Mu Cetus they would be best at mid-night, charts 3, 4, 5, & 6. Schwassmann – Wachmann was 2.5 degrees north of omega Pisces and would be best after 21:00 EST, but should be a viable target until at least mid-night with that in mind I printed charts 7 & 8. The next two comets, Machholz and Tsuchinshan would not be high enough in the sky to make viable targets until the wee hours in the morning, 01:30 EST for Machholz and 03:00 EST for Tsuchinshan so, charts 9, 10, 11 and 12 were printed for these two Solar System visitors.



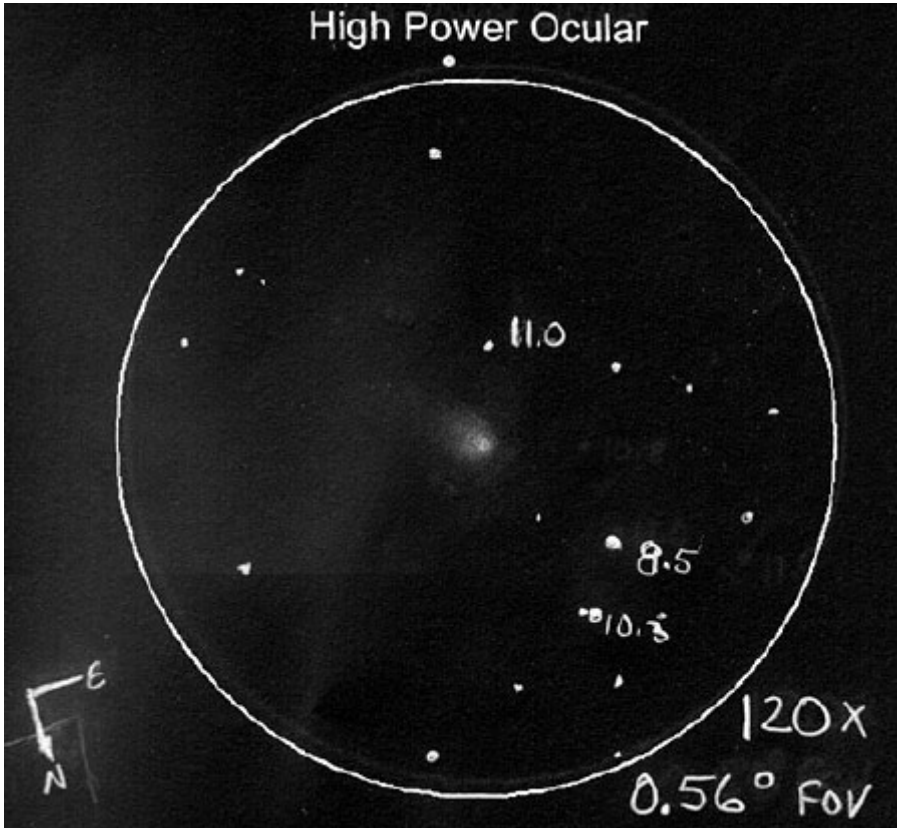
Comet 78P Gehrels

When I plan an observing session as ambitious as this I like to check and recheck all of my equipment and pack everything into my car, well ahead of time so as not to forget any essential item, like eyepieces, flashlight, or the wonderful charts I printed. I also like to get to my observing site early enough to get a good spot, on Peach Mt. that can sometimes be a challenge, as there is limited space and only 1 semi-level area on the hill. This night John Causland, (John is an excellent observer and one of my favorite people to observe with), beat me to it, but not to worry, just to the west of that area there is a fairly good spot which would ultimately give me views of some of the rising objects that much earlier. It was very clear and had the temperature been a few degrees higher there would have been many more Lowbrows and guests. Even so, there were still a substantial number of both represented that night, estimated public 75+, Lowbrows 15, which is very good for a mid-November open house. As I started to set up I noticed a small group of people standing off to one side, with somewhat hesitant looks on their faces, not knowing exactly what to do or how to act. Seizing the opportunity to make them feel a little more comfortable and placing myself center stage, I invited them over to see how I set up my telescope. The youngsters in this little group were very enthusiastic and moved right over, asking questions and enthralled with how I turn a 15" cube into a working 12.5" telescope that stands over 70" tall. I fielded the usual questions like, "where do you look thru?" and "how do you know where to point it?" from the kids and "how much does some-

thing like that cost?" from the parents.

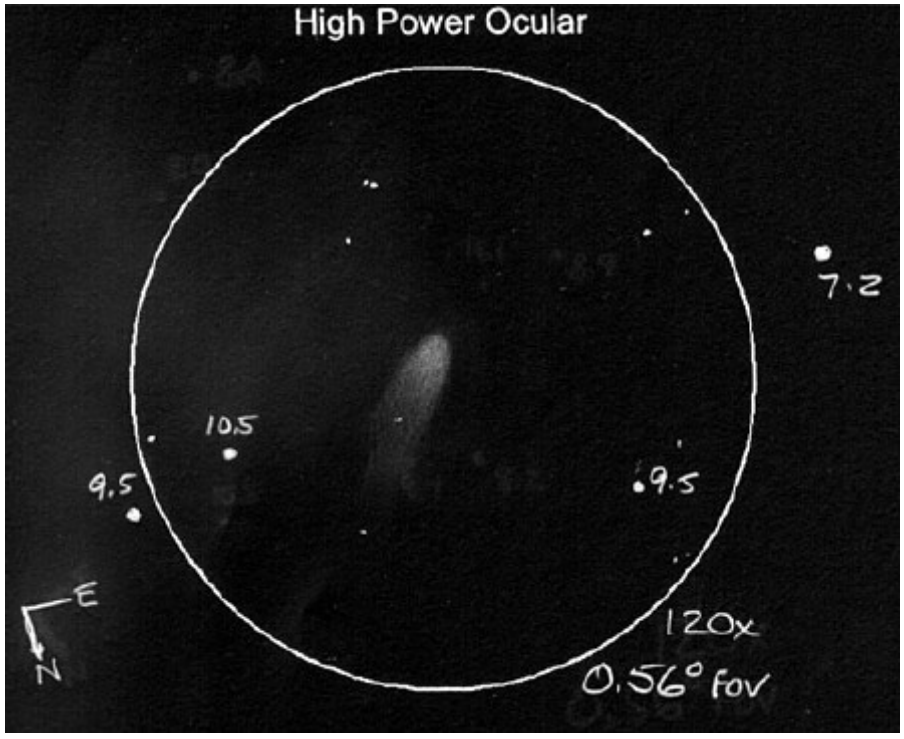
Once I had all of my equipment set up and sky grew darker, it was time to show these people some of the "really cool stuff" we like to look at. I have always viewed astronomy as a one person hobby that is as much fun to share with others as it is to relax alone in the peaceful, cool and quiet darkness of the night. As much as I love to perform center stage, entertaining the crowds with tales of gods and heroes, I do also love the solitude of this hobby, alone under the stars with only my thoughts and the occasional chirping crickets.

Ah, enough of this waxing poetics, its time to do some observing! As the crowds moved from scope to scope and the hour moved toward 21:00 EST, I slid my optics toward the area of the sky where my first target lay. First find sigma Andromeda with my 38mm Erfle eyepiece in place, and then slowly nudge the scope toward the southwest and ….. **BINGO**! C/2004 Q1 Tucker is easily visible as a 6 arc minute, 10th magnitude, elongated fuzzy patch of sky, with a significantly brighter condensed spot in the coma at the northeastern edge would put the m1 = 9.5 magnitude. A slight contrast difference in the background sky extending an additional 10 arc minutes southwest before fading into the darkness, hints of a tail. One down, five to go, and the night was young. As the public and the other Lowbrows all took their turns at the eyepiece, I spent a little time looking over the charts for the next comet on the agenda. 29P Schwassmann – Wachmann should have been my next target but the region of Aries where 78P Gehrels and 32P Comas Sola were lurking was high enough that I opted to try for them next. So once the scope came back to my control, I moved it down first find 5 Taurus in the low power wide field eyepiece and then slowly slide it back to the west until …. there it was 78P Gehrels and my second target for the night. Not quite as bright as Tucker but still very easy to see, as similar in size and shape but at least a 1/2 of an order of magnitude dimmer overall and not nearly as bright or condensed coma area, M1 was estimated to be about 10.0 to 10.2 magnitude. After a few a my fellow observers, including Norbert Vance, astronomy professor at Eastern Michigan University got to see the second comet of the night, I moved the telescope over to Mu Cetus and then back to the east about a degrees and check the field of view chart to find that 9th magnitude star that should be about 4.5 arc minutes northeast of 32P Comas Sola, okay …. Hmmm, nothing in the low power eyepiece lets pump up the power a bit. Now just to the left and little above that bright star is that something? Try averted vision …. there is something, extremely faint and diffuse over an oval spot about 2.5 arc minutes in size, it is almost imperceptible from the background sky, I need someone else to verify this one. A quick look around and I noticed John Causland nearby so I called him over to check and confirm, that what I see is actually there. After a few moments of checking my charts and the field of view a couple more times John turned to me and said that he too could see an extremely faint comet like object where I said I was seeing it. Now for those of you keeping track that is comet number 3. Norbert Vance heard John and I talking about this extremely faint comet, so after a fine tuned scrutiny, he too confirmed that there was definitely a very faint something there.



Comet C/2004 Q1 Tucker

Now, 32P Comas Sola is without any doubt the faintest comet I have ever seen and to estimate its m1 using surrounding field stars defocused to a similar size puts it at 12.6 magnitude. By now it was moving toward mid-night and I notice that the area of Pisces that 29P Schwassmann – Wachmann was getting a little lower in the southwest, so I push the scope over in that direction. My over-confidence was at an all time high, but I wasn't too sure about this next comet and after searching in vain for about twenty minutes, that confidence was waning. I knew I was in the right area, so I pushed the power up a little and started my search again. I could see on my FOV chart that there was an 8th magnitude star about 15 arc minutes to the north-east and I could see that star but where was the comet? Then just as I was thinking about giving up there it was, much smaller than I was looking for and surprisingly brighter than I expected, how could I have missed it? A 30 arc second 12.5 magnitude triangular shaped smudge with a very obvious stellar nucleus, I quickly called Norbert Vance over to verify my 4th comet of the night. He commented that he had never seen 4 comets in one night he was very pleased and complimentary of both my hunting skills and my equipment. Well, it was only 01:00 EST and I had over an hour to go wait before my next comet was high enough in the sky to be seen.



Comet C/2004 Q2 Machhol

About this time Norbert Vance had gone home, but two late arriving Lowbrows had just shown up, Nathan Murphy and Peter Alway, so while John Causland and Nathan were busy assembling the 18" truss tube Dobsonian, Peter came over and asked me if I would put the Orion Nebula in the eyepiece for him. Peter Always is one of the founding members of the University Lowbrow Astronomer and very good amateur astronomer in his own right, so, I slide the scope over and centered the request in the FOV and relinquished the scope for the next 25 minutes to Peter, who proceeded to take out his drawing pad and sketch M42. As he finished up his drawing, I noticed that Saturn had poked its rings above the tree line to the east which means that it was about 30 degrees above the horizon and that makes for fairly good views of the ringed giant. So, I slide the scope over and pushed the power up over 200x and just enjoyed. Peter came back over sat right down and proceeded "hog" my scope for another 15 minutes, but it was okay, I needed to take a little break.

Just before 02:00 EST Peter gave up control of my scope and I again went back to comet hunting. This time it was C/2004 Q2 Machholz lurking in Columba, the Dove and only 18 degrees above the southern horizon. Now if I am able to find this comet I will have two "firsts" with one observation. The first "first" is observing five comets in one night and the second "first" is actually observing an object in the constellation Columba. That would be pretty cool I don't know anyone in the Lowbrows that can say that. So let's start by finding M79 a bright globular cluster in the southern realms of Lepus, the Hare. A quick search and M79 was in the bag and now I needed to drop the scope 6.25 degrees southwest and …. WOW! that was easy and boy it's big and bright. When I say big and bright I mean Machholz compares very nicely to the 7th magnitude globular I just saw, in both size and brightness. Jim Forrester thought that as bright as it was he too should be able to find it and after a little time searching with his 4" TMB f/6.2 Apochromatic refractor, Jim recorded his first object observed in Columba. C/2004 Q2 Machholz shows as a bullet shaped coma spanning some 10 arc minutes in size, with a very evident tail stretching northwest some 25 arc minutes. A very impressive

Mark and his 12.5" f/5.6 reflector

comet, which is destined to put on a great show in early January when it skirts the outer minions of the Pleiades and when this comet is predicted to be at it's brightest. Okay, if you are keeping track that was comet number 5, and with any luck at all in about an hour comet 62P Tsuchinshan should be positioned well enough to afford an observation by yours truly. Both Jim and I were starting to get a little cold and tired, so I suggested that we go for a bit of a rest from our feet and some heat for the rest of us. For the next fifteen minutes or so, we sat in the warmth of my car talking and resting. Jim indicated that he was encouraged and a little inspired by his success at finding an extended object like Machholz in his 4" refractor and that in the future he would be trying to observe more faint fuzzies.

I love challenging myself and pushing the limits of both my eyes and my equipment, and this night's observations are just another part of an ongoing journey that takes me to the far reaches of the universe and to our own galactic backyard. More than anything I feel like I have an unquenchable thirst for learning new things and seeing new sights these are the forces that drive my passion for astronomy. But, there I go again getting all philosophical and such; let me get back to observing my 6th comet for this "Long Night of Comets." I told you at the beginning of this article that 62P Tsuchinshan was located in Leo and that meant waiting until 03:00 EST to attempt picking this one up visually with the 12.5" scope. Now to find this comet I need to kind of create an equilateral triangle almost directly west of Regulus and eta Leo, that point in the sky was easily 30+ degrees above the eastern horizon and enough above the tree line that I could just make up a few 5th magnitude field stars to help guide me to the right area. Oh, thank the great and powerful atmospheric gods for clear, transparent and dark skies at Peach Mt. this night. Because with a little boost in power and a check of the FOV chart I bagged my 6th comet and confirmed it with John Causland's well tuned eyes. 62P Tsuchinshan was small like Schwassmann-Wachmann was and visually dimmer against what I would say was a brighter background that Schwassmann-Wachmann, so estimates of its m-1 maybe be a bit skewed, lets just say my best guess would put it at 12.5 magnitude with a very slight central condensation.

There you have it folks, a long winded account of how I saw 6 comets in one night. I know there may be some skeptics out there, so I have included my field drawings from that night and you are more than welcome to ask any of the people mentioned above if they saw the same. I want to thank John Causland, Jim Forrester and Norbert Vance for helping me verify some of the more suspect comets. I won't report it or record it, if I don't see it and confirm it!

Mark Deprest's website is: 3 Leaps of The Gazelle

He is a member of:
American Association of Amateur Astronomers
Association of Lunar & Planetary Observers
University Lowbrow Astronomers
Astronomical League

MallinCam™ Video CCD Observational System

by Jack Huerkamp

Part 1

My interest in Video Astronomy began when I read an article entitled "Deep-Sky Imaging with Integrating Video Cameras" in the December 2003 issue of *Sky & Telescope*. I read and re-read this article and the comments about "seeing up to *three magnitudes fainter* than those objects visible through a conventional eyepiece through the same instrument" really caught my attention. I checked out the websites for the vendors listed and I joined the videoastro Yahoo E-Group. I monitored the messages to it and was amazed by the images posted.

In early May of 2004, two of my fellow Pontchartrain Astronomy Society club members, Walter Sarrat and Steve Sholar, invited me over to their observatory to see a video CCD integrating camera in action. I also brought along my vintage orange C-8 and f/6.3 focal reducer to do some observing as the skies at their location are fairly dark for southeast Louisiana. Steve had his camera installed in his Short Tube 80 that was ridding piggy-back on his 6" Celestron refractor. The camera's output was directed to a 13" TV/VCR. The views were simply amazing. There was more detail seen in Comet C/2001 Q4 NEAT using the ST80 and camera than I could visually see through my C-8. I quickly packed up my scope and spent the rest of the night looking at the TV's screen. My wife, Jacqueline, stated that through the use of the camera, she could finally see detail in celestial objects – detail that she could not see when looking through an eyepiece. After that one session with a video CCD integrating camera, I knew I would purchase one. But, which one should I buy?

Between May and July, I continued to monitor the conversations on videoastro. One day I saw a reference to the MallinCam; and I contacted Rock Mallin of Pro Com Electronics of Ottawa, Ontario, Canada. I asked him why I should consider his line of cameras instead of the one my friend had. He provided detailed information on the benefits of his products and a list of his customers that he recommended I contact. I did so and after corresponding with them, I decided that the MallinCam was the camera for me.

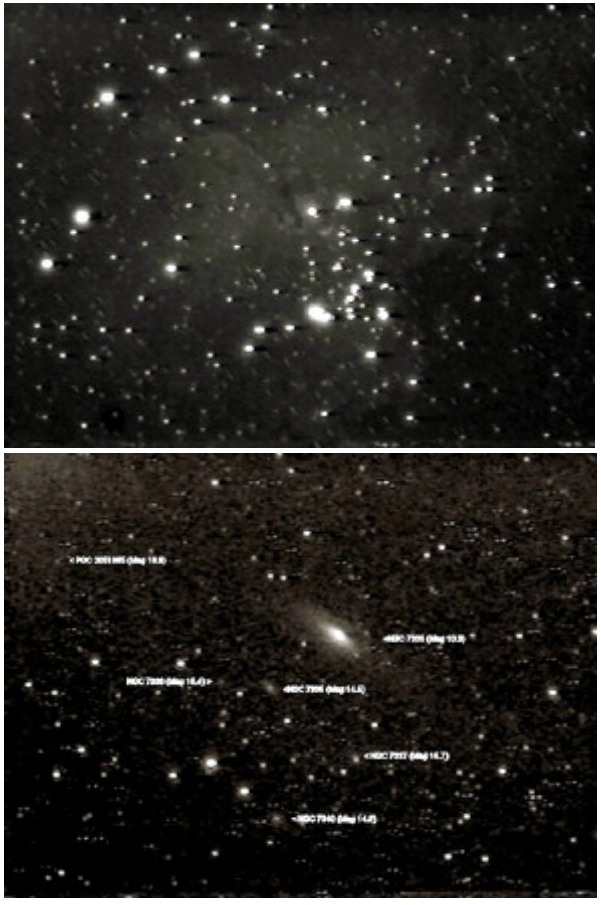
However, I could not decide if I wanted to get the MallinCam PRO (B&W) or the MallinCam II Color. To simplify the process, I ordered one of each in early July, and I received them on September 3rd.

On Sunday, September 5th, I had the first chance to observe with the MallinCam PRO. I used my 6" Celestron refractor and focal reducer to change the system to f/5. I removed the PRO from its case, placed it into the focuser, hooked up the power and video cables, attached the video cable to my 13" TV/VCR and focused the scope on M17, the Swan Nebula. Nebulosity filled the screen of the TV.

M17, the Swan Nebula

I moved the scope to M16, and watched the monitor as the Eagle soared into view.

Even with my 17.5" TeleKit under dark skies, the Eagle



M16 (top) and NGC 7331

has proven to be an elusive target. But in my magnitude 5 backyard, I was seeing it live with a 6" telescope!

The last target for the night was NGC 7331. Not only did this galaxy show spiral structure on the monitor,

Pier and 'scope

there were several other galaxies visible on the monitor – including PGC 2051985 at magnitude 16.8. I kept trying to remind myself of the size of the scope I was using.

I didn't get a chance to test the Color unit until Sunday, September 19th. On that morning, I had my 8" f/4 Newtonian set up on my Byers 812 mount and pier to my new observatory (the slab is finished – all that remains are the walls, track and roll-off roof!). This is the same mount I used with the 6" refractor.

I placed the camera into the focuser and aimed the scope at M42. The screen on my TV/VCR quickly revealed the Orion Nebula in all its colorful glory. There was nebulosity everywhere in shades of red, pink, purple and blue. The dark obscuring matter that forms the "Fish's Mouth" was three dimensional, standing up over the bright nebula below. The center of the nebula near the Trapezium was aglow – with the stars totally over-exposed. M43's "Shrimp" shape was clearly resolved with the center being pink and the outer edge's being bluish-purple. I spent the next hour looking at the screen while moving the scope around to reveal detail in other areas of M42/M43. The 2.1 second maximum cycle time for a new image made it easy to do so. The image of M42/M43 below is a single frame

M41 and M42 in Orion

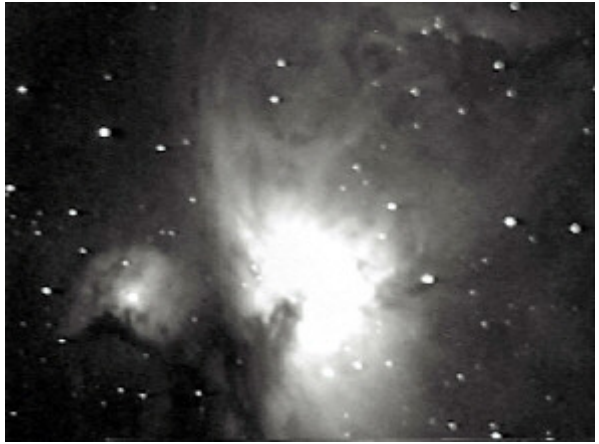
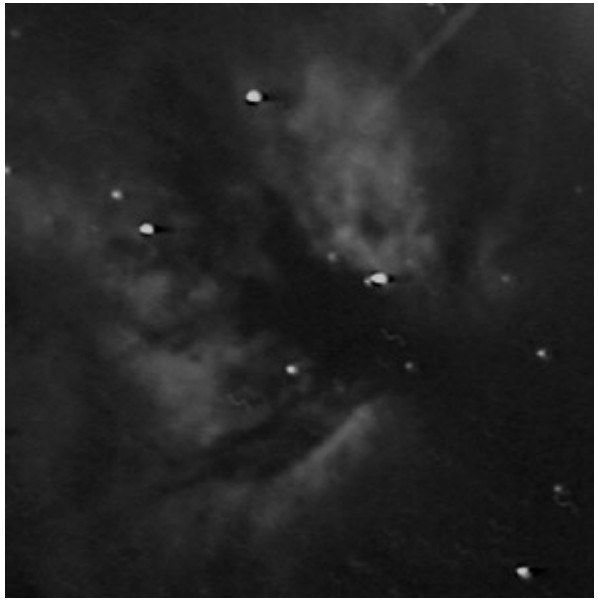


Image from MaillnCam Pro camera



The Flame Nebula in Orion

The Horsehead Nebula

from the VHS recording, with a single dark frame subtracted. No other image processing was performed.

At about 4:30 AM, I decided to swap cameras and see what the more sensitive MallinCam PRO would show in the Orion Nebula. A B&W image is shown for comparison.

The photo above is a single frame from the video. The nebulosity is more prominent in the B&W image due to the increased sensitivity of the camera. Also, there is much greater detail in M43 and the dark lane that separates it from the nebulosity below. To close out the evening, I decided to look for the Horsehead. I centered the scope on Zeta Orionis and drifted to the Flame Nebula.

From it, I slid past NGC 2023, a diffuse nebula near the Horsehead. As I moved the scope in the direction of my target, I started to see the dark silhouette of the Horsehead drift into the field of view.

Images of the Flame and Horsehead are included showing their relative brightness. Each is a stack of about 10 frames from the video with no dark frame subtraction. The Flame was much more obvious on the monitor; however the Horsehead was definitely seen live on the TV. By the way, just after taking the video of the Horsehead, I decided to look at the primary and secondary mirrors – they were covered with condensation. I can only imagine what the Flame and Horsehead would have looked like with dew-free mirrors! My initial tests with both MallinCam cameras were successful.

System Components

The MallinCam Video CCD Observational System is manufactured by Rock Mallin ,and it is designed specifically for astronomical observing. The video board has been custom designed by him to eliminate the need for the long exposure times of 8.5 seconds found in other cameras currently on the market. He has reproduced the competition's performance using only a 2.1 second integration time. This is very beneficial for users of Dobsonian and other Alt-Az mounted scopes.

MallinCam cameras are adjustable from 2X to 128X integration, and they can be used visually and for imaging the Sun (with proper filtration), Moon and Planets. On the next page is a picture taken with the MallinCam II Color during the October 27th lunar eclipse.

Every camera is hand assembled and tested to the highest applicable standards. All camera components

Image of the Moon with MallinCam II Color camera

are Grade 1 with no exceptions! The CCD sensors are generally Grade 1, with Grade 2 sensors available on the PRO.

The system includes the following items shown below:

- Combination video/power cable
- Regulated power supply
- Component Male/ BNC Female Adapter
- BNC Male/Component Male Adapter
- Allen Wrench
- Camera with Lens Cap and 1 ¼" Adapter

Video Astronomy

What is Video Astronomy and how does the MallinCam Video CCD Observational System fit in?

Video astronomy replaces the eyepiece in your telescope with a specialized camera. It takes the photons that strike its CCD sensor, electronically amplifies the output of this interaction, stores the information, and dumps the data to a monitor. To engage in this facet of astronomy, all that is needed is a fast telescope, a specialized camera like either of the MallinCams, and a monitor. A "fast" scope is critical – preferable f/5 or faster. In the case of Schmidt-Cassegrain scope, the use of an f/6.3 focal reducer does not make the scope fast enough. If you have a SCT, invest in a Meade f/3.3 focal reducer/field flattener. This device is made for CCD camera use and changes a normally slow f/10 telescope into a fast f/3.3 unit.

Focal reducers can also be used with refractors and Newtonian reflectors to speed them up and increase the Field of View. There are several on the market, but they generally require considerable in-travel. Either the mirror needs to be relocated toward the secondary in the case of a Newtonian, or the tube needs to be shortened in the case of a refractor. Rock Mallin has developed a variable (0.38 – 0.68) focal reducer that slides into the 1¼" adapter on the front of his cameras. I have successfully used this focal reducer on my 6" f/8 refractor; however, I need to trim about ½" off of the truss tubes on my 17.5" to achieve focus with either the II Color or PRO.

Regarding monitors, it is best to use one that has 800+ lines of resolution, as the better the monitor, the better the appearance of the target. On occasion, I have observed at locations without the benefit of 110 volt AC power. In those cases, I have used a portable DVD player to view the output of the MallinCams. Although not as clear as a high resolution monitor, the views were quite nice. A picture of the 7" DVD player I use is shown opposite.

The purists will say that looking at a monitor to see what your scope is aimed at is no different than getting on the Internet and downloading images. I disagree! Doing the latter does not require the ownership of a telescope, nor traveling to remote locations to observe. Neither does it involve getting cold in the winter or attacked by mosquitoes in the summer. Finally, it does not afford the companionship of getting together with friends to view the heavens. The ***only*** difference is that instead of the photons of light hitting the rods and cones in your eye; they hit the pixels on the CCD sensor where they are processed and sent to the monitor.

The benefits afforded by video astronomy are many:

1 Live viewing of the Sun, Moon, Planets, DSOs, Transits, Occultations, and Eclipses is possible by many observers at the same time.
2 People with vision problems, such as "floaters", or those who wear glasses are able to see detail not

Portable DVD Player

visible to them when looking in an eyepiece.

3 People with physical handicaps that make standing or climbing ladders impossible are able to participate in the hobby.

4 The effective size of one's telescope is increased dramatically through the use of the specialized camera.

You may ask how is it possible to increase the size of your telescope without trading up to a new one. The answer is simple – the use of very sensitive, low Lux CCD chips, combined with the high Signal-to-Noise of the video processing circuitry, and the ability to accumulate up to 2.1 seconds of video results in you being able to see many magnitudes fainter than you can see visually.

As an example of this phenomenon, I offer the following. On the night of September 18th, the evening before I took the above images of the Orion Nebula, I had several members of the PAS over to observe with the MallinCams. One of the targets with the 8" f/4 Newtonian was Stephan's Quintet. Not only were all observers able to see the five galaxies that comprise this compact grouping, we also saw live on the monitor NGC 7320C – a 16.7 magnitude galaxy just outside of the Quintet. According to Sam Brown, in his book "All About Telescopes", an 8" scope is capable of seeing stars to magnitude 13.3 in a magnitude 6.2 sky. On the night of September 18th, the limiting magnitude at the Zenith was 5; thus the magnitude limit of my scope on the 18th was reduced to 12.1. However, a 16.7 magnitude galaxy was seen live on the screen of my 13" TV/VCR – a 4.6 magnitude gain. My 8" scope was detecting DSOs that would be visible to the eye in a 50"+ optical instrument. My scope had effectively grown in size!

To be continued...

ancient irish divisions of time - the months:

By James O'Connor

The astronomy insert to Charles Vallancey's *Grammar of Iberno-Celtic* contains a good deal of material on the origin of the names of the months, both in Irish and in English. The author claims that many of the names assumed to have a Latin origin probably originated from older Celtic sources. The claims are, I think, worth an airing, even though the author can hardly be regarded as having proved his points of view.

Antoine Court de Gebelin

For the sake of completeness I think it desirable to repeat here Vallancey's remarks to the effect that the Irish words for month are *mí* and *míos*, *míos* being compounded of *mí,* the moon and *aos*, age. *An* is a planet; hence *mí-an* is the month planet and *lu-an* the lesser planet, each of which signifies the moon or month.

He goes on to say, "It is as plain that the Latins derived the names of the months from the Celts as it is that the French borrowed theirs from the Latins." This is clearly an exaggeration but the arguments that he puts forward are, at least, thought provoking. Following is a summary:

January (modern Irish Eanáir): Vallancey initially quotes from Gebelin's *Monde Primitif* to the effect that January and February were the *last months of the year* with the ancient Romans and that the name *Januarius* derives from *Janus* or the sun renewed.

However, he disagrees with the derivation of the name given by Gebelin. He states that the Celts always began their year with January, the original Irish name implying as much. This is *Ceann-vair, Cain-barr, Chean-bhair, Cinn-bhair* or *Ginn-bhair***,** all expressing the same thing, i.e., *initialis*, the beginning and literally *caput-capitis***,** head of heads, since both parts of the compound word signify the head or upper part. The transition to *Januar* was easy as the Latin *Janua* implied a door or gate, and the opening of the door of the new year was analogous to *Ceann-vair***.** He goes on to claim that the Turkish *Khan*, the German *Hhans*, the Persian *Chan*, as well as the English *King* and *Baron* all owe their origins to these Celtic words.

February (modern Irish Feabhra): Vallancey discounts Gebelin's claim that this word derives from the Latin *februare***,** to expiate (from the sacrifices offered at that time of year for the dead and for the expiring year). (In a Latin dictionary that I consulted there is no verb *februare***,** although there is the plural noun *februa,* meaning sacrifices for the ghosts of the dead.) He states that *barr***,** signifying the top, corresponded to the Latin *Calendae* and thus betokened the beginning of a month. Hence came *Feabh-barr-ra* February, or the Calends of the good moon, the "goodness" deriving apparently from the fact that it was the first month of spring. February is also named *Mí-chuir***,** the sowing month, also *faoillidh*, the joyful month and *Ceidmíos d'on Earrach***,** the first month of spring. He goes on to claim that the Latin termination *rius***,** as in *Januarius* and *Februarius* comes from the Celtic *re, ra, raidh***,** a division of time.

March (modern Irish Márta): Gebelin is quoted by Vallancey as stating that the Romans pretended that this name was derived from *Mars*, the father of Romulus, but that this is a contradiction since March was

A Dolmen in County Clare, Ireland

dedicated to Minerva and October was the month sacred to Mars. Vallancey gives the name a much more mundane origin. He says that the Celts called the month *Mí-mart*, i.e., the heifer month and that the Latin *Mars* derived from this. They also called it *Mí-Reaith*, the Ram's month, due to the presence of the sun in *Aries* at this time of year in the long ago.

April (modern Irish Aibreán): Gebelin is quoted as stating that the name comes from the Latin *aperire*, to open, the bosom of the Earth being then opened from the winter frosts. This month was, he states, sacred to the goddess of the graces, called in Greek *Aphrodite*. However, Vallancey holds that the name of the month in Irish is *Obráil* or *Obráileas*, i.e., the working month from the diversity of employments that engage the attention of the husbandman at that time of year. *Obair* is work and *ileas* many. Rather enigmatically, he goes on to say "the month is also called *Aibreáin*, or the star *Aib*; and *Diblin*, a name I cannot explain." He does not attempt to identify the star *Aib*. My own tentative suggestion is that it is *Aldebaran*; the sun would have been in conjunction with this star during the month of April in the two millennia immediately preceding the Christian era. Perhaps *Diblin* is a corruption of the final three syllables of the same name. The first syllable, *Al*, is, of course, the Arabic definite article.

May (modern Irish Bealtaine): There is a further quotation from Gebelin to the effect that the month received its name because of being held sacred to the old, the *maiores*. Vallancey, true to form, has an alternative explanation. It goes as follows. The month, as is evident from its name in Irish, was sacred to the god Baal, *bal-tinne* signifying Baal's fire. During the solemn festival marking the first of the month, marriages were forbidden. Indeed, not only was marriage forbidden but, in addition, those married in the preceding year were obliged to appear and account for their behaviour! Thus, it was called the month of *Mai*, *Maidh*, or *Maith*, signifying mystery or sorcery. *Maith-eas*, "goodness", is explained in the old glossaries as *Mai-fhios*, the knowledge of *Mai*, or druidical mystery.

June (modern Irish Meitheamh): Gebelin is quoted as claiming that the name derives from the month having been held sacred to youth (*junior* meaning younger), as *May* (according to his claim) received its name from its association with the old. However, Vallancey states that the Iberno-Celts named the month *Mí-guine* and *Mí-gabhun*, or the month of calves, since the cows drop their calves in this month. The Latin *Junius* was readily formed from *gabhun*, pronounced *giune*. June was also called *Óig-mí*, the month of the young and *Mí-mheasmac*, or the month of the beautiful offspring. (The modern word *Meitheamh* means "middle", i.e., the middle month of summer).

In the concluding part I will describe what Vallancey has to say about the remaining six months of the year.

Relativity

In November 1919, shortly after Albert Einstein's theory of relativity was confirmed by observations made from the island of Principe during an eclipse (light was shown to have been bent by gravity as Einstein had predicted), Sir Arthur Eddington, an early advocate of relativity, was approached by Ludwig Silberstein at a joint meeting of the Royal Society and the Royal Astronomical Society.

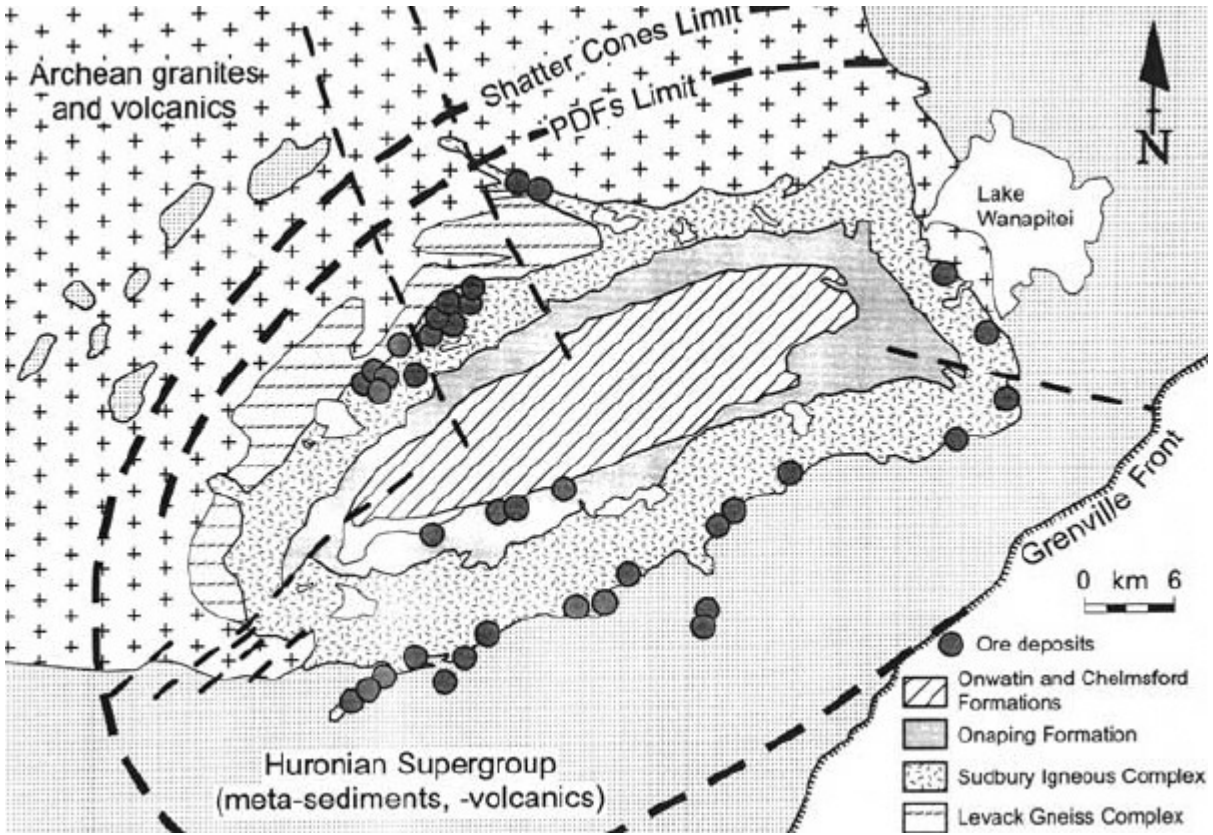
"Professor Eddington," Silberstein declared, "you must be one of three persons in the world who understands general relativity." When Eddington demurred, Silberstein continued: "Don't be modest, Eddington." "On the contrary," Eddington replied. "I am trying to think who the third person is!"

Scientific Revolution

Albert Einstein was visited one day by one of his students. "The questions on this year's exam are the same as last year's!" the young man exclaimed. "Yes," Einstein replied, "but this year all the answers are different."

Aerial Explorations of Terrestrial Meteorite Craters

By Charles O'Dale



The Sudbury Crater - Part 2

The next series of images will document my ground tour of the Sudbury Meteorite Crater that was guided by geologist Frank Brunton. We started north-west of Windy Lake outside of the Sudbury Igneous Complex (SIC) in the country rock and worked our way south-east along highway 144 to the center of the crater. This route gives a most fascinating display of the changing geology throughout the SIC feature caused by the bolide impact.

Surrounding Brecciated Footwall Rocks

Midcrustal 2.4 to 3 billion year old migmatites (a rock that incorporates both metamorphic and igneous materials) of the Levack Gneiss Complex are found immediately outside of the north rim of the Sudbury Igneous Complex (SIC).

Shatter cones have been reported up to 15 kms away from the periphery of the SIC. The cones commonly point toward the centre of the Sudbury basin, indicating that the Sudbury crater structure has undergone considerable erosion since the impact occurred 1.85 billion years ago. (Note 2).

This 18cm shatter cone (picture on next page) was found outside the SIC basin in the Sudbury Structure country rock and was given to me by Frank Brunton. Shatter cones are shock-deformation features that form from impact pressures of typically 2-10 GPa up to ~30 GPa (the GPa, or gigapascal, is a unit of pressure that corresponds to 9900 times atmospheric pressure). They represent the only distinctive and unique shock-deformation feature that develops on a megascopic scale (e.g., hand sample to outcrop scale). They appear in outcrops as distinctively curved striated fractures that typically form partial or complete conical structures (image). They are commonly found beneath

Sudbury shattercone

impact crater floors, usually in the central uplifts of complex impact structures, but they may also be observed in isolated rock fragments within brecciated units.

This image of the shattered (brecciated) bedrock was taken just north-west of Windy Lake on highway 144. When driving into the SIC from the north this is the first indicator of an impact event. The pulverization of these footwall rocks illustrates the deformation of the local bedrock that immediately followed the bolide impact.

Shattered (brecciated) bedrock

Black pseudotachylite Matachewan Dykes are found throughout this area in the rock cuts along the highway. These dykes predate the formation Sudbury Meteorite Crater and possibly offered a weakness in the Levack Gneiss. Pseudotachylite Sudbury Breccia (SB), a breccia having the aspect and the black color of a volcanic rock (a tachylite), was formed within these dykes when the high pressure from the meteorite impact was applied to these rocks and then abruptly released. This caused the rock along and within these dykes to partly melt. The dykes containing the pseudotachylite were welded shut as soon as the motion created by the impact stopped. Subsequent stress was supported by the fault as though it had never been active. The entire period of activity of a fault filled with pseudotachylite may be measured in minutes. (e.g., Pseudotachylite is a rock type formed by friction-induced melting, during very rapid deformation) (Philpotts 1964; Maddock 1983).

Matachewan dyke

The pulverized and melted country rock injected into the pink gneisses has similar chemistry to the derived gneisses. The greenish rock is secondary alteration of clays and micas from existing minerals within the rock. The brecciated zones fall along structures inferred as super faults or fault-controlled structures. The crustal rocks underlying the crater would have experienced substantial fracturing from the impact and the shear concentration of the billions of tonnes of the metal-rich rock that subsequently formed could have easily have created more fracturing while sinking down deep into the crust. (F. Brunton – private correspondence with the author)

In this image (right) the SB is illustrated as the black pulverized (by the impact) country rock injected into the pink gneiss. SB pseudotachylite dykes range from veins less than 1 mm thick to massive zones measuring up to 1 km thick and extending for approximately 45 km. Formations of SB are found up to 100 km north of the SIC. (Note 1).

Sudbury Breccia

Most of the SB dykes dip vertically or steeply and apparently have no obvious preferred orientation with respect to the present shape of the Sudbury Structure.

Characteristics of the Sudbury Breccia:

- concentrated within 5 km of the SIC;
- formed by dynamic means during very rapid deformation. (e.g., post impact friction-induced melting during the extensive and very rapid deformation and brecciation of the footwall rocks);
- a two component rock consisting of a fine-grained to

aphanitic matrix surrounding inclusions of host-rocks and minerals;
- comprised of mineral and rock fragments derived predominantly from wall rocks, set within a typically dark, microcrystalline to fine grained matrix, generated by grinding and frictional melting; and
- mostly associated with the 2.5 billion year old Matachewan dykes. In the immediate area of the shattered bedrock are samples of the Matachewan dykes.

The middle of the Matachewan Dykes are mostly finer grained while toward the outside we find pyroxenes (any of a group of igneous-rock-forming silicate minerals that contain calcium, sodium, magnesium, iron, or aluminum, usually occur in short prismatic crystals or massive form, are often laminated, and vary in color from white to dark green or black). A strange unexplained characteristic of the dykes are the green flecks superimposed on the rocks, shown here in this image:

Matachewan dyke flecks

Sudbury Igneous Complex (SIC)

Approximately 1 km south from Windy Lake is a hill containing the North Range lower zone of the SIC. This area experienced an instantaneous melt from the bolide impact 1.8 billion years ago. These salt and pepper coloured felsic norite rocks consist of medium course crystalline, igneous textured plagioclase containing white feldspar and dark pyroxenes & mica. The lower zone of the SIC is 500 metres thick.

Just over the crest of the hill and a bit further into the structure are the pinkish tinged rocks of the SIC North Range upper zone. Like the lower zone of the SIC, these rocks experienced an instantaneous melt with the bolide impact. These rocks are three parts granophyric intergrowth (interlocked wedge shaped quartz and feldspar crystals) to one part plagioclase feldspar plus biotite, amphibole, chlorite and opaque minerals. The upper zone is 900 metres thick.

Pinkish rock in upper zone

Grey breccia from the Whitewater Group

The colour and texture differences between the upper and lower zone of the SIC is caused by the different rates of cooling after the impact.

Whitewater Group - Onaping Formation

Further into the structure is the Whitewater Group, a 1400 m thick section consisting of fall-back of the original country rocks that has been hydrothermally altered. Ground water had seeped into faults caused by the impact, the water boiled creating hot springs through the Whitewater Group.

Further into the structure is the darker Whitewater breccia containing smaller rock fall-back fragments originating from the igneous quarts granite north range footwall. Here the breccia indicates the introduction of carbon. A biogenic origin of the carbonaceous material (soot) found in the black Whitewater Group is theoretically caused by the evaporation/condensation from the hot impact fireball and/or from a later global cloud. The

Black breccia from the Whitewater Group

colour of the rock is not uniform indicating that the carbon is not uniformly distributed.

The impact probably occurred in a shallow sea as there is evidence of water flow-back in the top layers of the Whitewater Group. The quantity of "breccia fall-back" specifies that the fall-back segment of the impact lasted a substantial amount of time (perhaps hours) before the appearance of the returning tsunami.

The size of the Sudbury structure implies that the hydrothermal venting continued for thousands of years after the impact. The rocks of the Whitewater Group comprise (oldest-to-youngest): initially glass-rich breccias of the Onaping Formation, carbonates and argillites of the Vermilion and Onwatin formations, and arkosic sandstones and wackes of the Chelmsford Formation (Note 2).

Bucky balls (soccer-ball-shaped molecules of 60 carbon atoms) possibly of extraterrestrial origin and with traces of helium and argon gas trapped inside were found in this breccia.

Whitewater Group - Chelmsford Formation

The Chelmsford Formation comprises about 850 metres of mostly wacke and siltstone, essentially sedimentary rocks deposited over the Whitewater Group after the impact. In the image note the ripples encased in the rock caused by water flowing back and forth. Paleocurrent (an ancient current whose flow direction is inferred from sedimentary structures and textures) studies indicate that the predominant flow direction was to the southwest, parallel to the long axis of the Sudbury Basin.

Ripples encased in rock

This next image of the top surface of the Chelmsford Formation illustrates striations on the sedimentary rocks caused by the glaciers. Note the circular carbonate concretions that are caused by ground fluids passing through the carbon rich mud rocks that would have been full of organics. The anaerobic waters caused chemical precipitation exchanges forming these things

Glacial striations

around a nucleus of organic material. A combination of the ground water and the chemical nature of the organic material in the particular layers, determines the size. (Frank Brunton – private discussion).

The controversy over the origin of the Sudbury Structure and the Sudbury Igneous Complex was ongoing before the beginning of mining in the area. My father was involved in the mining industry before the onset of WWII and he always thought that the structure was somehow involved with volcanic activity. I remember being in high school when my science teacher mentioned that he had recently read a paper hypothesizing that the Sudbury Structure may be the result of a meteorite impact. Also that it had happened long before any life had evolved to survive on land (evolution was not allowed to be taught in Ontario schools at that

time!). I found this idea fascinating and I think that this was probably where my interest in meteorite craters originated.

The magnitude of scientific information describing the Sudbury Structure over the years has amplified my desire to fully explore this crater and others. This project was one of my lifelong dreams realized and I am still amazed at the magnitude of the "event" that created this structure.

The rim of the SIC north wall is visible in the background while facing north a couple of km west of Hanmer and situated in the center of the Sudbury Structure.

Notes

1 J.E. Mungall and J.J. Hanley: ORIGINS OF OUTLIERS OF THE HURONIAN SUPERGROUP WITHIN THE SUDBURY STRUCTURE. Department of Geology, University of Toronto.

Frank Brunton: THE FACTS-SIGNIFICANCE OF SUDBURY GEOLOGY & MINING HISTORY.

RawShooter Essentials 2005

If you use a digital SLR (dSLR) camera for taking astrophotos and you use the RAW file format, then RawShooter Essentials 2005 (RSE) might very well be a useful piece of software to add to your astrophotography kit.

I came across this software in a camera magazine a few weeks ago. It's pretty simple to use and certainly makes working with RAW files much easier than the the software that's usually provided with dSLRs.

The software enables digital photographers of all abilities to import, view, edit and convert large batches of RAW files. RSE will be available for free for a limited period of time. The only thing you need to do is to register your application. The idea behind this is that as many users as possible will give RSE a try and then decide to buy the next version that will add more workflow and imaging features.

V1.1.2 of the software has been released (May 02, 2005) and is still free to download. If you've already discovered this software, download V1.1.2 and simply install it over your existing version.

http://www.pixmantec.com/index2.html

- Gary Nugent

The Great Astronomers

When Voyager II encountered the Planet Uranus in 1986, it revealed a planet which had remained almost totally obscure to us since it was first discovered in 1781. The man who did discover it ended his adult life as the most celebrated English astronomer of his day. He started it as a German draft-dodger

By Tim Carr

Wilhelm Herschel was born in Hanover, Germany, in 1738. His father was a musician, and the 14 year old Wilhelm followed in his footsteps, into the band of the Hanoverian Guards. However, the coming of the Seven Year War made being in the army somewhat less attractive, and in 1757 he was conveniently removed from the Guards by his parents and brought to England where his abilities as a musician quickly brought him success. In 1766, he took up a position as a music teacher in Bath, and earned a good living at it.

Astronomy

His musical success brought him enough spare time (and money) to indulge his passion for learning. Like most great scientists and discoverers, his greatest asset was his curiosity. Herschel's interest in music led him into mathematics, and that in turn led him to optics. Optics and astronomy are, of course, closely

Wilhelm Herschel (1738-1822)

linked, and when he got hold of a copy of Newton's great scientific works, his destiny was fixed. But there was a problem - money. Herschel might have been making a good living out of his music, but it was never going to be enough to pay for a high quality telescope. So he decided to make his own.

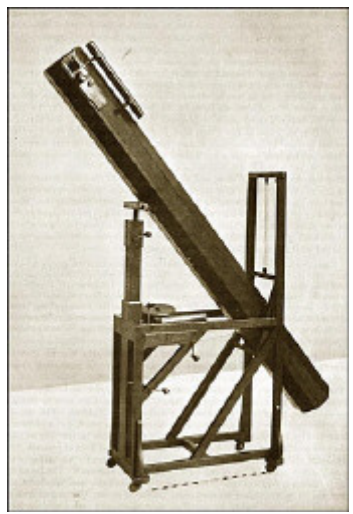
This might have been hard work for Herschel, but it was good news for the rest of the astronomical community, as Herschel turned out to be one of the greatest telescope makers of all time.

In 1772, he returned to Germany just long enough to collect his sister, Caroline, and bring her back to England. This was also good news, for Caroline was to prove as talented a lens grinder as her brother.

The Work Begins

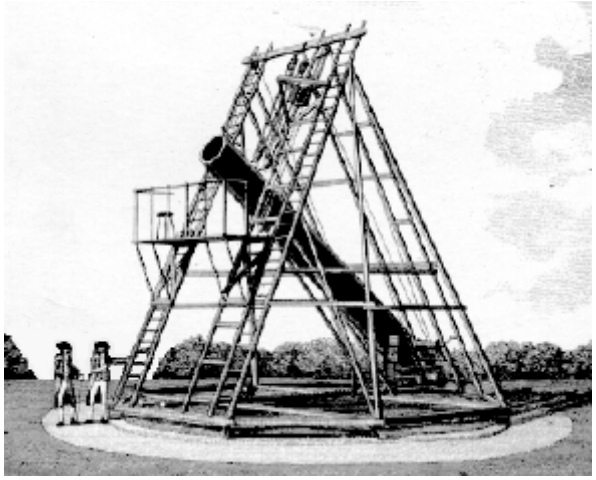
Wilhelm Herschel was one of the most dedicated astronomers of all time. At times during his mirror grinding, he could not even take his hands from the mirror, so his devoted sister, Caroline (who looked after him for most of his life), literally fed him by hand.

After about 200 unsuccessful efforts, they finally produced a first-class reflector that was not only the best in the world, but it was the first reflector that was actually *better* than a refractor. Nowadays, most of the best and biggest telescopes in the world (and out of it - i.e. Hubble Space Telescope) are reflectors, since it is easier to make large mirrors than large lenses, as mirrors need only be ground on one side, whereas lenses must be perfectly ground on both. This breakthrough would have come eventually, but Herschel was the one who made it.



Herschel's 7-foot telescope

In 1775, the telescope - a six foot reflector - was set up in the back garden of Herschel's home and he began to observe in earnest. One night



Herschel's 48" reflector

in 1781, he noticed an object in the sky that should not have been there. As his telescope was so good, he could clearly see that it was not just a point of light, but a disc. Thinking that he had found a new comet, he reported it as such. However, when the orbit of the new `comet' was calculated, the path was found to be almost circular. Also, it was out past the orbit of Saturn. Comets don't usually have circular orbits, Unlike the planets, their orbits tend to be very elliptical and, being so far away, such a comet would have to be absolutely enormous to be visible.

It became clear to Herschel that what he had found was not a comet, but a planet. This was the first planet to be discovered since antiquity and, by itself, this was a major discovery. Herschel, however, had done more than expand the Solar System, and as if that was not enough, he showed that there was still more to the universe than was revealed in Newton's work.

Herschel named the new planet `Georgium Sidum' after King George III of England. Wiser heads prevailed, and on the advice of Bode, the planet was called Uranus - the father of Saturn.

The fact that Herschel had been willing to name the planet after the King (who was himself a Hanoverian) made a favourable impression with England's monarch, who subsequently appointed Herschel as his personal astronomer at a salary of 300 guineas a year. Now a full time astronomer, Herschel still continued making telescopes to supplement his income, supplementing it even further by marrying a wealthy widow in 1778.

Survey

Herschel decided to survey the whole sky as seen from his latitude, completing it in 1789. He had no sooner finished when he began a second survey using an even larger telescope of 7 feet (2.13 metres) in diameter. The main focus of his observations were binary stars. By measuring the parallax of two stars that appear close together, he was able to show that their apparent proximity was not always due to a 'line-of-sight' appearance. If the stars were *not* really close together, their parallax shifts should be different. In some cases they were not, and it was obvious that these binary stars *really were* close to each other. By 1793, he had started to catalogue 800 of them.

The study of the movements of the stars that Herschel carried out lent further weight to Newton's laws of motion and gravity, showing that they were truly universal. But Herschel was not finished with the solar system yet. In 1787, he discovered two moons of Uranus, Oberon and Titania, (he reported four others, but these were mistakes). Then using a huge telescope, he discovered another two moons orbiting Saturn, Mimas and Enceladus. The telescope had a mirror 48 inches (1.2 metres) in diameter, partly paid for by George III and its light grasp was so great that Herschel could see that the rings of Saturn rotated.

Deep Sky

In 1781, Herschel obtained a copy of Messier's catalogue of deep sky objects. Using his superior optics, he was able to resolve many of these clusters into individual stars. Following on from this, he published a catalogue of nebulae, in 1802, in which he listed over 2,500 objects. In 1820, he published an updated version of his catalogue which now contained *5,000* examples. His deep sky observing led him to theorise on the Solar System's position in the universe at large. Ptolemy had placed the Earth at the centre of creation. Copernicus had then dethroned the Earth, but had still kept the Sun at the universe's centre. Herschel made a more profound leap of imagination.

By counting the stars in various directions in the sky, he concluded that the visible universe consisted of a circular flat disc of stars, with the Solar System near, but not at, its centre. We now know this to be far from the truth, but it was a good and coherent theory for its time. Herschel even speculated that some of the nebulae he could see, might be other galaxies similar to our own which, of course, they are.

Herschel's idea of what our galaxy looked like

Infra Red

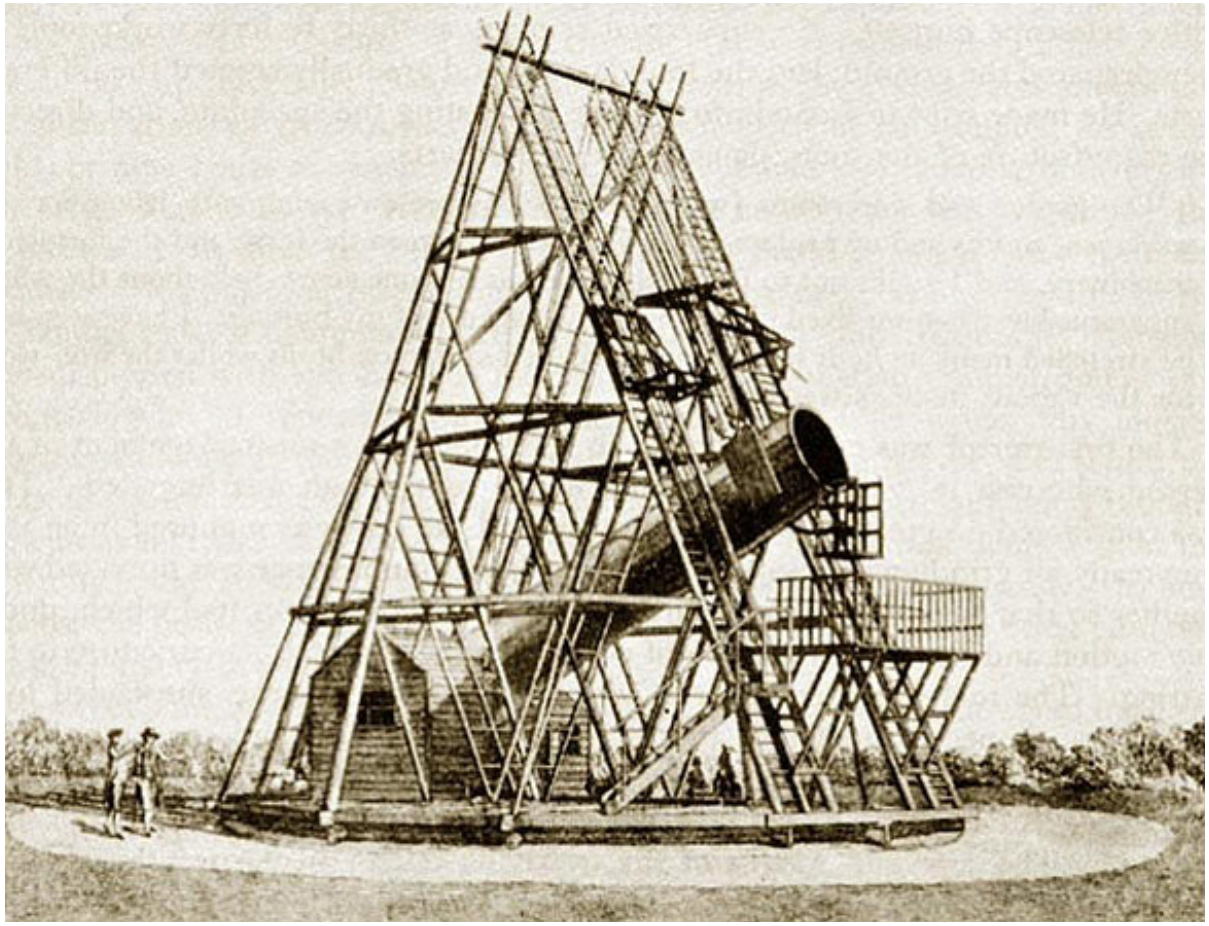
One of the most important discoveries that Herschel made was to measure the differences in temperature of different parts of the spectrum. What he noticed was that the hottest part was not in the visible spectrum at all, but in a region just beyond the red band. Herschel had discovered infra-red radiation, and stellar photometry was born.

Wilhelm Herschel died in 1822. Six years beforehand he had been knighted, and throughout his career he was showered with numerous honours. Admittedly, he also had one or two rather strange ideas, such as the possibility that the Sun was *inhabited*, but the quality of his telescopes, what he discovered with them and his dethronement of the Solar System from the centre of the universe all combined to make him one of the greatest astronomers that has ever lived.

Indian Moguls

In 1856, a British civil servant named William Herschell was entrusted with the task of administering the pensions of Indian Moguls. Many undeserving recipients were known to be collecting under false names. Indeed, in at least one case a pension was being doled out to someone who, apparently, had lived more than 200 years.

Herschell's solution to the flagrant fraud? He invented a system of fingerprinting.



Above right: Herschel's 40-foot telescope (ca. 1788) with which he found the sixth and seventh satellites of Saturn, Enceladus and Mimas

Submissions

I'm looking for submissions for the next and future issues, whatever part of the world you live in.

The first six issues should give you a flavor for the kind of articles I'm looking for. Talk about any astronomical trips you've been on, whether they're to local or national Star Parties or vacations based around an astronomical event such as a solar eclipse. Give warts-and-all reviews of equipment you own, from a lowly pair of binoculars, to eyepieces to large expensive telescopes. Let readers know what you think of recent books on astronomy or your appraisals of astronomy software, whether they're freeware, shareware or commercial applications; profile your club or society; talk about any equipment you've built or modified, about your experiences with astrophotography and send in some of your results. As of this issue (Issue 7) contributors will receive payment for their material.

Please include any photos or illustrations with your submission. You should own copyright on any photos submitted (i.e. you've taken the photos yourself) or have obtained permission from the copyright owner.

As an aid to production, it would be appreciated if material submitted was emailed to the Editorial email address (in either Word .DOC or .RTF format or as a text file). Please do not format the text (as I'll have to reformat it to suit Photon) and send photos as email attachments rather than embedded in documents. Where this is impossible, articles should be provided in hardcopy format (typed or printed) and mailed to the Editorial (snail) mail address. Submissions on floppy disk or CD can also be sent to that address. Images should be in .GIF or .JPG format to save on space and bandwidth.

Material received by any means other than email will not be returned unless a submitting author specifically requests the return of material and a stamp addressed envelope or sufficient return postage is included.

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Cover Picture: IC 434 (The Horsehead & Flame Nebulae). Telescope: Celestron 102mm; Camera: SBIG ST-10XME; Exposure: Red = Luminance = 40 min. Red, Green & Blue = 20 min. each. The eastern most star in the belt of Orion is Alnitak. It is the bright blue star on the left side of the image above. It is located a little over 800 light years from the Earth. The area surrounding this massive, and extremely bright, star is a treasure trove of celestial objects. Perhaps the most famous is the Horsehead Nebula (B33). It is a dark cloud of obscuring matter silhouetted against a bright red emission nebula designated IC434. Another prominent object is the Flame Nebula (NGC 2024) which is located just below Alnitak. IC435, also called the Lump Star Nebula, is located just below and a little left of the Horsehead.

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Left: M33. Telescope: Celestron 102mm; Camera: SBIG ST-10XME/AO-7; Exposure: L = 95 min. Binned 1X1 - R,G & B = 30 min. each. Binned 2X2; Filters: William Optics minus Violet; Astrodon TruBalance CRGB filters. M33 is a member of the Local Group of galaxies, which our own Milky Way and the Andromeda galaxy (M31) belong. M33 is not as large as either the Milky Way or Andromeda and is considered

an "average" sized spiral galaxy. It is approximately half the diameter of the Milky Way with an estimated mass of about 40 billion solar masses. At a distance of 3 million light years, its location is a little farther from our position than Andromeda. It is approaching our location in the Milky Way at a speed of 182 km/sec. Correcting for the Sun's motion around our galactic center, M33 is approaching the Milky Way at 24 km/sec. Many areas of nebulosity can be seen in the arms of M33. These stand out as small "pink" areas in the galaxy and are similar in nature to nebulae such as M42 (The Great Nebula in Orion). M33 is difficult to view visually from light polluted locations but can be easily seen from dark sky locations with modest sized telescopes.

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Left: an image of a waxing crescent moon taken on Sept. 20, 2004. Top: a waxing crescent moon taken on Feb. 11, 2005.

I used a 6" generic dobsonian (1200mm focal length) scope, 20mm Plossl lens with a focal reducer, and a 2.3 mega pixel Kodak DX3600 digital camera. Pretty simple setup. Nothing fancy and nothing real expensive. And I am by no means any kind of photographer. I just point my scope at the moon, focus, point the camera in the lens of the scope and click. But I have to admit I'm pretty impressed with some of the pictures I've gotten. I sometimes do a little touch up work in Paint Shop Pro but not a lot. I think the pictures show you don't need to spend a lot to take fairly decent pictures of the moon. They are not professional quality but I have printed out 8 X 10 copies of them and they look pretty good. Thought I would share them. Just shows you don't need to spend a lot to enjoy and capture the beauty of the moon.

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